EnviroMon

User's Guide

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1 Introduction

EnviroMon is designed for long-term recording of data from a number of locations. The system offers the following features:

- PC-based display software with remote logging units
- Permanent retention of recorded data on your PC
- Wide range of data display and analysis options
- Easy-to-use software
- Simple connection between logger and converter units
- Modular system for easy upgrades
- A wide range of options to report alarm conditions
- Support for remote data download (modem, GSM etc.)

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1.1 Safety warning

We strongly recommend that you read the general safety information below before using your product for the first time. If the equipment is not used in the manner specified, then the protection provided may be impaired. This could result in damage to your computer and injury to yourself or others.

Maximum input range

The EnviroMon system is designed for use with many different converters, sensors and signals.

Converter	Designed input range	Max input voltage
EL001	Cannot measure voltages	N/A
EL026	Cannot measure voltages	N/A
EL016	0 V to +2.5 V	±30 V
EL037	-2.5 V to +2.5 V -10 V to +10 V 4 to 20 mA	±30 V
EL040	1 V RMS	±30 V
EL041	±60 mV	±10 V

Any voltages in excess of the maximum input voltage specified in the above table may cause permanent damage to the unit.

Mains (line) voltages

EnviroMon is not designed for use with mains (line) voltages.

Product grounding

The ground of every product is connected directly to the ground of your computer through the provided interconnecting cable. This is done in order to minimise interference. Always use the provided cable to attach the product to your computer.

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You must take care to avoid connecting the ground input of the products to anything that may be at some voltage other than ground. If in doubt, use a meter to check that there is no significant AC or DC voltage between the ground input and the point to which you intend to connect it. Failure to check may cause damage to the products and your computer, and could cause injury to yourself or others.

Take great care when measuring near mains equipment. If a sensor is accidentally connected to mains voltages, you risk damage to the converters and your computer, and your computer chassis may become live.

You should assume that the products do not have a protective safety earth. Configuration errors or use on voltages outside the maximum input range can be hazardous.

Repairs

The units contains no user-serviceable parts. Repair or calibration of the units requires specialised test equipment and must be performed only by Pico Technology or its authorised distributors.

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Viruses. This software was continuously monitored for viruses during production, but you are responsible for virus-checking the software once it is installed.

Support. If you are dissatisfied with the performance of this software, please contact our technical support staff, who will try to fix the problem within a reasonable time. If you are still dissatisfied, please return the product and software to your supplier within 28 days of purchase for a full refund.

Upgrades. We provide upgrades, free of charge, from our web site at www.picotech.com. We reserve the right to charge for updates or replacements sent out on physical media.

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2 User's Guide

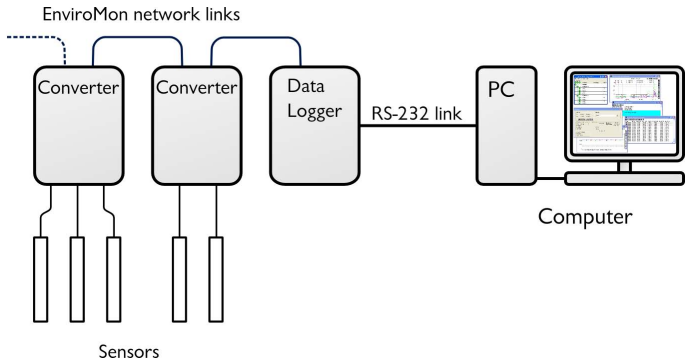
This section of the manual explains how to use EnviroMon once it has been installed. For technical information on modifying your system or installing a new system, please see the Installation Guide. 41

2.1 System overview

EnviroMon consists of the following items:

- Computer
- Logger
- Multiple converters
- Remote alarm units (optional)

The following diagram shows how a typical system is interconnected:



The EnviroMon PC application performs the following tasks:

- System configuration
- Long-term data storage
- Display, analysis and printing of recorded data

The internal battery backup ensures that the logger stores data continuously, even when the computer is turned off or disconnected or the mains (line) power fails. The data stored in the logger is automatically sent to the computer when the logging software is next started.

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2.2 Getting started

2.2.1 Looking at current readings

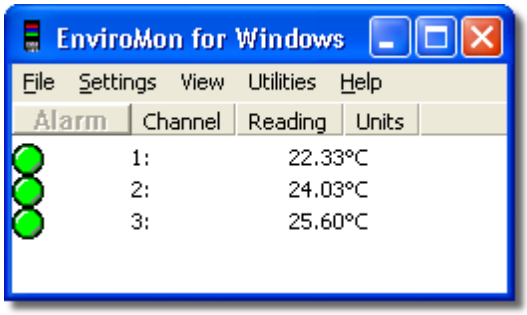
To look at the current readings, start the EnviroMon program:

1. Click the Start button on the Windows desktop
2. Select Programs or All Programs
3. Select EnviroMon

If it is more than a few minutes since you last ran the software, the computer automatically transfers the latest readings from the logger. While this is happening, the Download box shows how many readings have been transferred.

When the computer has the latest readings from the logger, it displays a Monitor view 7 containing a list of sensors and their temperatures.

The Monitor view gives access to all other parts of the program. All the commands you need to operate and maintain the system are available from the main menu near the top of the window:



The Monitor view

Here are the commands that you will need to use at first:

- Select View and then another option to view stored data in a variety of formats
- Select Settings, then Configuration, then Change, then Quick 68 to make changes to the configuration
- Select Help then Contents to get the help file contents page
- Select Help then Index to get an index for the help file
- Select Help then Guided tour for a guided tour of the functions used in day-to-day operation

2.2.2 Displaying the graph

To look at the graph, you first need to display the Monitor view 7.

Next, take the following steps:

1. Select View from the main menu
2. Select Graph from the View menu

The computer will display a graph showing all data recorded so far. See Graph view 10 for more information about this window.

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2.3 The display windows

EnviroMon can display data in a variety of different formats, corresponding to the following window types:

- Monitor window 7 - shows current readings and alarm states as a list
- Graph window 10 - shows how the readings vary over a period of time
- Summary window 13 - shows the statistics and error information for a period of time
- Spreadsheet window 14 - shows detailed readings in a format that can be copied to the Windows clipboard
- Event window 16 - shows each of the occasions on which a sensor has failed or gone out of range

The Monitor window is displayed when you start the program. The other windows can be selected from the View menu in the Monitor view.

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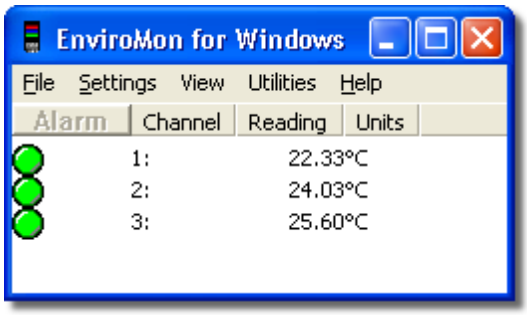
2.3.1 Monitor window

Where to find it: always open when EnviroMon is running

The Monitor view is normally the first thing you see when you start EnviroMon, and looks like this:



Main menu. Contains commands for configuring the system:

- select which sensors appear on the monitor view
- activate other windows
- configure the system
- specify various options, including colour and sound

You can find out more about the menu by pointing at a menu option and pressing the F1 key.

Status lamps. At the left of each line is an indicator lamp that shows the state of the sensor:

Sensor value is within range.

Sensor value is currently out of range, but has not been out of range long enough to raise an alarm.

Sensor is in an alarm state. Double-click the lamp to cancel the alarm.

Sensor is an alarm state, but the alarm has been cancelled.

Channel. The name of each active sensor or deviation alarm.

Reading. The present reading from the sensor, updated every few seconds.

Units. The unit for this sensor reading, as configured in the Sensor information 94 dialog.

Notification icon. If you minimise the monitor view, the computer will display an icon for EnviroMon alternating with a status lamp that shows whether there are any warnings or alarms:

If an alarm occurs, you can then click the icon to restore the Monitor view.

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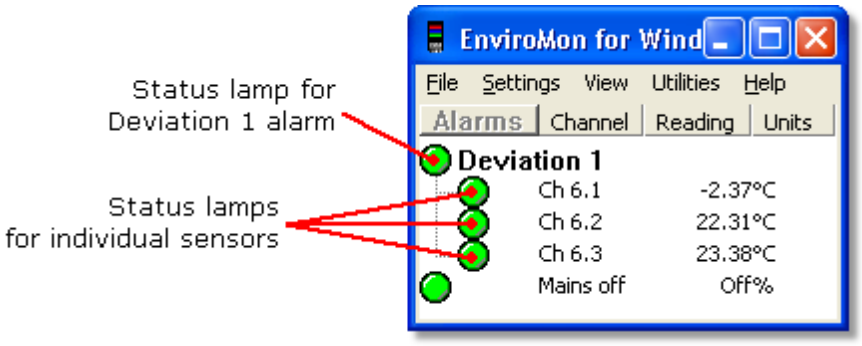
2.3.1.1 Monitor window with deviation alarms

If you have set up deviation alarms, the Monitor window [7] will display one or two extra columns of status lamps. The example below shows a simple setup with one deviation alarm:



In this example, the monitor window shows that a deviation alarm called "Deviation 1" has been set up for the Ch 6.1, Ch 6.2 and Ch 6.3 sensors. The deviation alarm has its own status lamp, in addition to the lamps for the individual sensors.

See also

- Nested deviation alarms [99], for a more complex example
- How to set up a deviation alarm [29], for a detailed procedure

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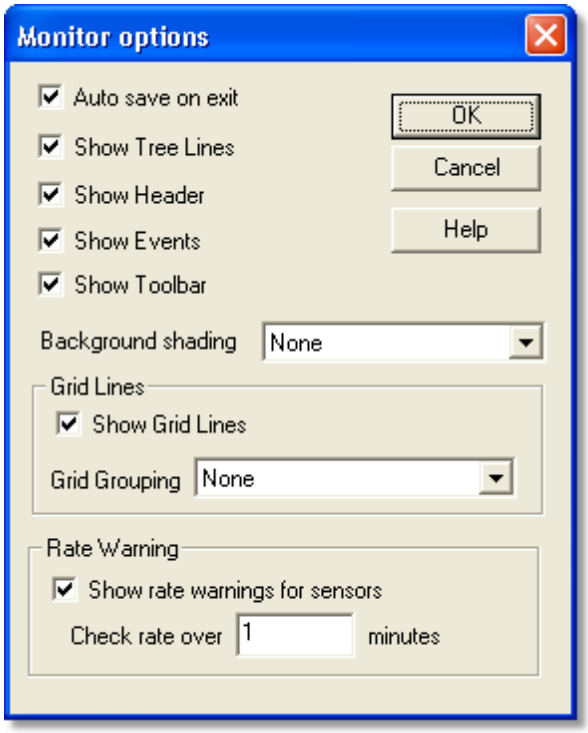
2.3.1.2 Monitor options dialog

Where to find it: Settings | Monitor | Options

This dialog lets you control the appearance of the Monitor view 7, 7



Auto save on exit. When this box is checked, the computer saves the graph settings when you exit from the graph window.

Show Tree Lines. The tree lines are the dotted grey lines that connect sensor status lamps and deviation alarm status lamps.

Show Header. The header is the row at the top of the table containing the status summary lamps and the column headings.

Show Events. You can switch the Events column on or off.

Show Toolbar. The toolbar is the row of buttons described under Monitor view 7.

Background shading. You can switch on background shading to make it easier to see which sensors are linked to which deviation alarms. The colours used are configurable from the Colours 21 dialog.

Grid Lines. You can switch on or off the solid black lines between rows and columns in the table. Optionally, you can show horizontal grid lines only between deviation alarm groups.

Rate Warning. Enabling this option adds a Rate column to the Monitor view 7. This column shows a green tick or a red exclamation mark for each sensor that has a rate warning value set in its Sensor information 94 dialog. The warning will be activated when the reading changes by the specified amount over the specified time interval.

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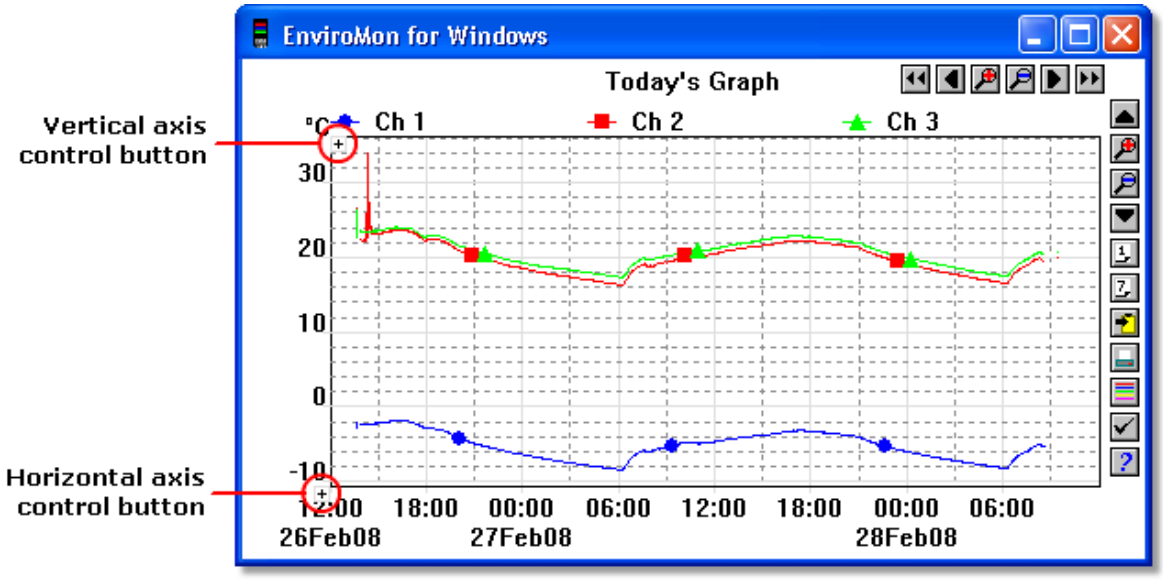
2.3.2 Graph window

Where to find it: View | Graph

When you select Graph from the View menu, the computer opens a new window like this:



If you move the mouse cursor onto the graph part of the screen, the computer will display the temperature and time at the current cursor position.

Horizontal control buttons. These control what time interval is displayed:

- **Scroll left.** Moves to the left by a whole display (earlier)
- **Scroll quarter left.** Moves a quarter display left (earlier)
- **Expand horizontal axis.** Magnifies the middle half of the display to fill the whole width
- **Shrink vertical axis.** Shrinks the current display to half size, so that more is displayed before and after
- **Scroll quarter right.** Moves a quarter display right (later)
- **Scroll right.** Moves a whole display right (later)

Vertical control buttons. The upper group controls the vertical range displayed. Note that if you use these controls to change the vertical range, auto-scaling is turned off. Use the options button (see below) to turn auto-scaling back on again.

- **Scroll up.** Moves a whole display up.
- Expand vertical axis. Magnifies the middle half of the display to fill the whole height.
- Shrink vertical axis. Shrinks the current display height to half size, so that more is displayed above and below.
- Scroll down. Moves a whole display down.
- **Select today.** Sets the time axis to run from midnight yesterday to midnight today.
- **Select this week.** Sets the time axis to run from the first to the last day of this week. By default, the first day of the week is Monday.

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General control buttons. These control general display options.

- **Copy to clipboard.** Copies the graph to the clipboard.
- **Print contents of window.** Prints the graph.
- **Select channels.** Selects the channels to display on the graph.
- **Window options.** Specifies the options for the graph.
- **Help.** Goes straight to help information specific to the graph window.

Rulers. Create the left ruler by clicking and dragging with the left mouse button, and the right ruler using the right mouse button. The graph window will then display, in the sensor list at the top, the readings for each sensor as it crosses each ruler. You can drag or redraw the rulers using the mouse or the keyboard. Use the following keys:

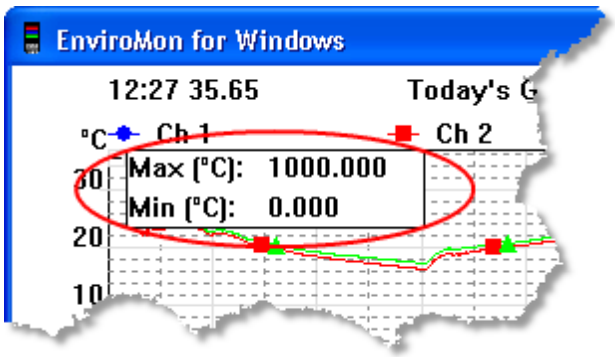
- Left / Right - move the left ruler by one sample period
- Shift+Left / Right - move the right ruler by one sample period
- Ctrl+Left / Right - move ruler faster
- Tab+Left / Right - move both rulers in unison
- Delete - remove first the right ruler, then the left

+ Reading range control button and Time range control button: see Range control buttons 20

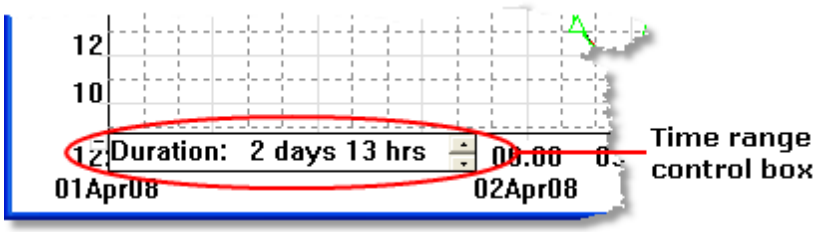
2.3.2.1 Axis control buttons

The axis control buttons appear in the Graph window 10.

+ Vertical axis control button. Opens a text box in which you can type the maximum and minimum values for the vertical axis. These must be within the range of acceptable values for the sensor. Click the − button to apply the values and close the text box.



+ Horizontal axis control button. Opens a text box in which you can type the scale of the horizontal (time) axis. You can also use the up and down spin buttons to change the value. The time can be set in hours or days, or a combination of both. Click the − button to apply the values and close the text box.



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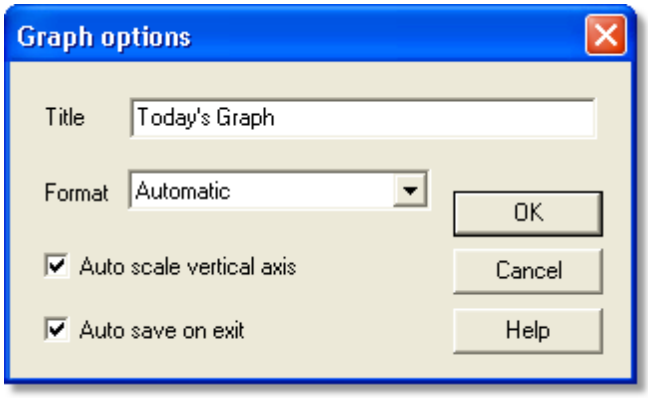
2.3.2.2 Graph options dialog

Where to find it: View | Graph 10 | button



Title. The name you want to give to the graph.

Format. Selects how the parameters will be displayed. The options are:

- Automatic. Divide according to units.
- Separate graphs. Draw a separate graph for each parameter.
- All traces on same graph. Display all parameters on the same graph.
- Graph for each group. Display a separate graph for each group (as chosen in the Select parameters 18 dialog box).

Auto scale vertical axis. When this box is checked, the computer automatically adjusts the vertical scale to fit the data that is to be displayed. If you click any of the vertical axis scaling buttons, Auto scale is turned off automatically.

Auto save on exit. When this box is checked, the computer saves the graph settings when you exit from the graph window.

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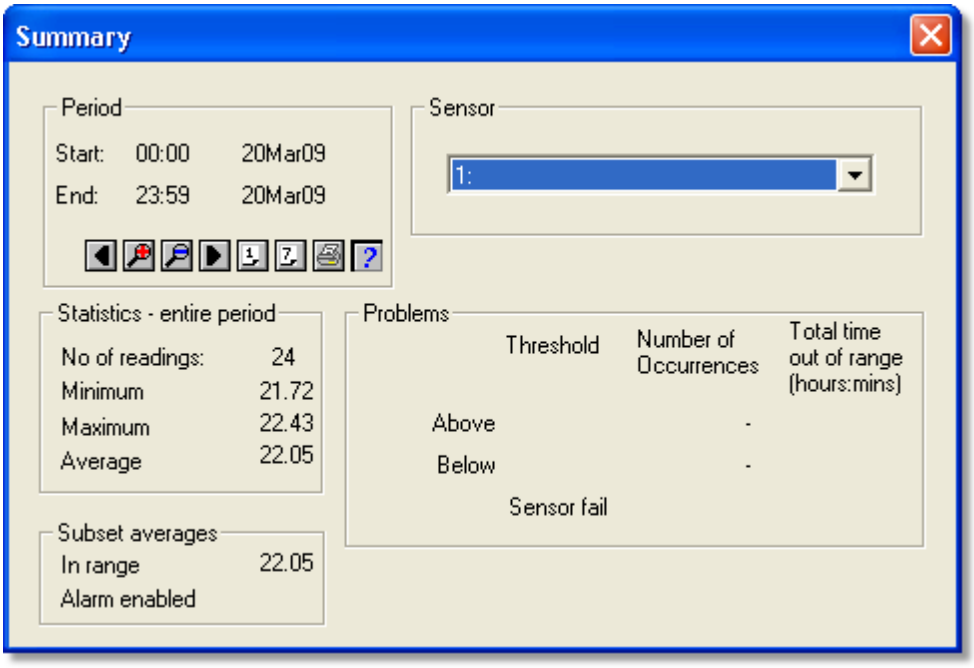
2.3.3 Summary window

Where to find it: View | Summary

When you select Summary from the View menu, the computer opens a new window like this:



The Period section of the window contains the time interval to which the summary applies. You can either type in a start and end time and date, or use the buttons to alter the range. The controls are as follows:

- **Earlier.** Moves a quarter period earlier.
- **Expand horizontal axis.** Halves the current period.
- **Shrink horizontal axis.** Uses twice the current period.
- **Later.** Moves a quarter period later.

The Sensor area of the window shows which sensor is to be displayed in the summary. If you select a different sensor, the display will be updated.

- Print contents of window. Prints a summary for all sensors for the current period.
- **Help.** Goes straight to help information specific to the graph window.

The Statistics section of the window shows the number of readings during the period for this parameter, and the minimum, maximum and average for the period.

If the readings go out of range during the period, the computer displays a separate figure for the average of the in-range values (it excludes the values that are out of range from the average calculation). This is useful if the parameter goes out of range only under known circumstances, such as during a defrost cycle on a chiller. The in-range average appears in brackets on the printed report.

The Problems section of the window shows the number of times and total time the value has been out of range. There are separate figures for above range, below range and sensor fail.

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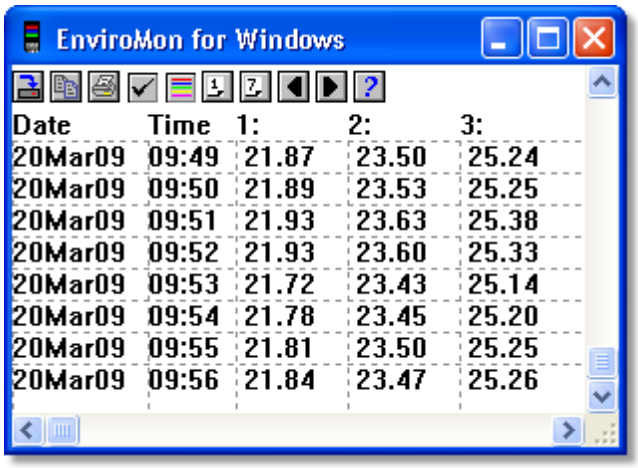
2.3.4 Spreadsheet window

Where to find it: View | Spreadsheet

When you select Spreadsheet from the View menu, the computer opens a new window like this:



There is one line for each reading. The first two columns show the time and date, and the remaining columns show the selected sensors. The scroll bar on the right selects the range of times to display.

If you select a range of readings, you can use the following buttons:

- **Write to disk.** Writes the readings to a disk file.
- **Copy to clipboard.** Writes the readings to the clipboard.

The following options buttons are available:

- **Print contents of window.** Prints out a summary for all sensors for the current period.
- **Window options.** Here you can specify whether to display individual readings, or average, minimum and maximum for a period.
- **Select channels.** Opens the Select parameters 18 dialog box.
- **Select today**
- **Select this week**
- **Earlier.** Move a quarter period earlier.
- **Later.** Move a quarter period later.
- **Help.** Go straight to help information specific to the spreadsheet window.

You can select a range in one of three ways.

- If all of the readings that you want to select are on the screen:

1. Point the mouse at the first reading
2. Click and hold down the left mouse button
3. Drag the mouse to the last reading, and the selected readings will be highlighted as you go
4. Release the left mouse button

- If the readings are a long way apart:

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1. Point the mouse at first reading
2. Click the left mouse button, and the first reading will be highlighted
3. Scroll down to the last reading
4. Point at the last reading
5. Press the Shift key and click the left mouse button

- If you wish to select all of the readings for one day:

1. Point the mouse at any reading during the required day
2. Click the left mouse button, and the reading will be highlighted
3. Click the button

2.3.4.1 Spreadsheet options

Where to find it: View | Spreadsheet 14 | button

Auto save on exit. When this checkbox is ticked, all spreadsheet window settings are saved automatically when you close the event window.

Show individual readings or Show aggregated readings

- When Show individual readings is checked, the spreadsheet window shows each individual reading.

- When Show individual readings is checked, the computer displays results which are aggregates (min / max / average) of the readings for the time interval specified below, and the controls in the Show aggregated readings box are enabled. If you select more than one of average, minimum and maximum, the computer displays the corresponding number of columns for each sensor in the spreadsheet, and adds a heading (max/min/ave) to each column.

Time interval per row. The time interval between each of the rows on the spreadsheet. If, for example, the logger is set to take a reading every minute, and you set the time interval per row to 60, each row will be the min/max/average of 60 readings.

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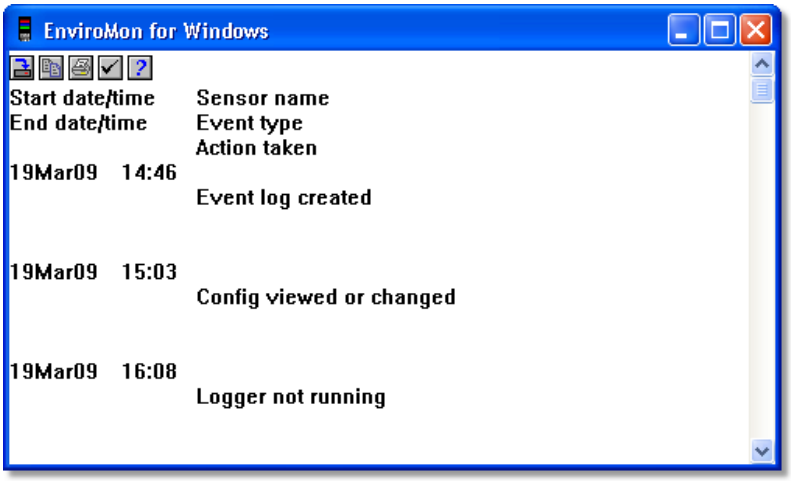
2.3.5 Events window

Where to find it: View | Events



There are two or four lines of text for each event. At the left are the start and end date/time, although the end date/time is omitted if the fault is still active. Next to these are the sensor name and a description of the fault. If Show action taken is enabled, the action taken will be displayed beneath the fault description.

The scroll bar on the right selects the range of times to display.

To select a range of readings, you can use the following buttons:

- **Write to disk.** Writes the events to a file on disk.
- **Copy to clipboard.** Writes the events to the clipboard.
- **Print the contents of window.** Prints the events.
- **Window options.** Specifies the options for the events.
- **Help.** Goes straight to help information specific to the events window.

You can select a range in one of two ways.

- If all of the readings that you want to select are on the screen:

1. Point the mouse at the first event
2. Press and hold the left mouse button
3. Drag the mouse to the last event, and the selected events will be highlighted as you go
4. Release the left mouse button

- If the events are a long way apart:

1. Point the mouse at the first event
2. Click the left mouse button, and the first event will be highlighted
3. Scroll down to the last event
4. Point at the last event
5. Press down the Shift key and click the left mouse button

To edit the notes on action taken for an event, double-click the event.

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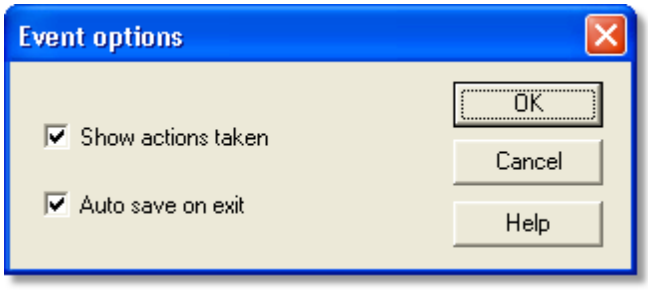
2.3.5.1 Event options

Where to find it: View | Events 16 | ☑ button



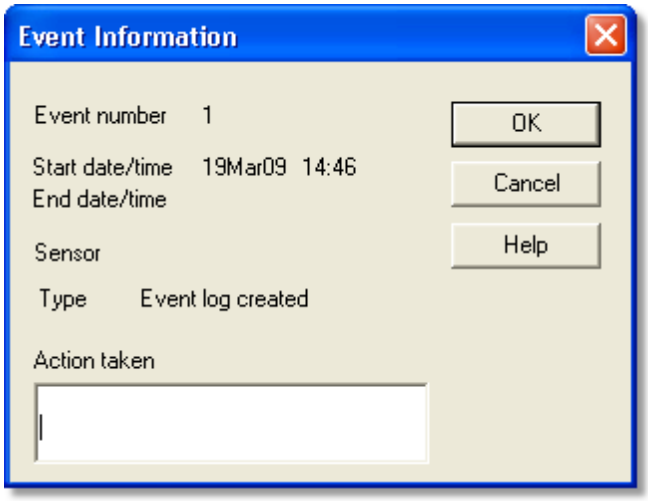
Show actions taken. When this is enabled, the details of actions taken will be displayed on the event window. This does, of course, reduce the number of events that can be displayed at the same time.

Auto save on exit. When this option is checked, all events window settings are saved automatically when you close the event window.

2.3.5.2 Event information dialog

Where to find it: View | Events 16 | double-click an event

This dialog appears when you double-click an event in the Events 16 window. It enables you to enter notes for an event - for example, to state what actions were taken to deal with the problem.



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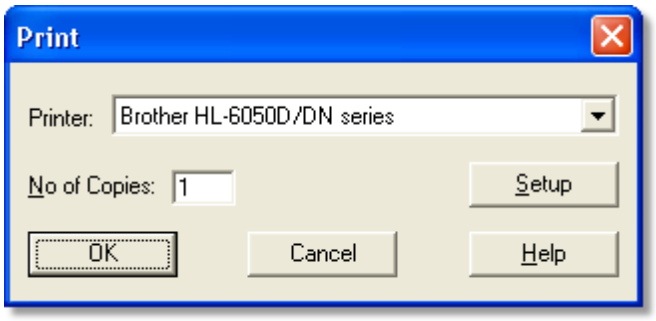
2.3.6 Common controls

These controls appear in more than one type of view:

- Print dialog 18
- Select parameters dialog 18
- Axis control buttons 20

2.3.6.1 Print dialog

Where to find it: View | Graph 10, Summary 13, Spreadsheet 14 or Event 16 | button



Printer. A drop-down list box with the name of the default printer. You can select a different printer if you wish.

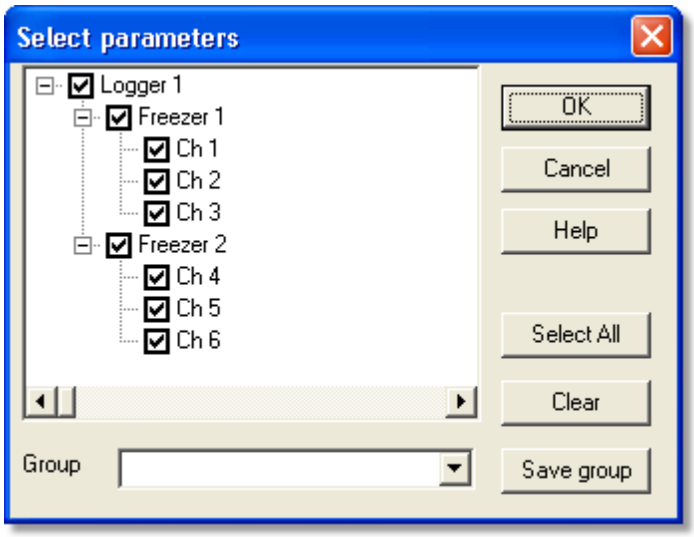
Setup. Use this button to open a dialog with setup information specific to the selected printer (for example, to set up for 'portrait' or 'landscape' pages). We do not describe this dialog here, as it varies according to the type of printer selected. Please refer to your printer's documentation for details.

OK. Once all the details are correct, click this button to start printing.

2.3.6.2 Select parameters dialog

Where to find it: Settings | Monitor | Channels

This dialog is used to enable and disable channels and to assign them to groups. This allows you to control how the channels are displayed in the Monitor view 7, the Graph view 10 and the Spreadsheet view 14.



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The main part of the dialog is a tree view showing which channels are available, and also which ones are linked to deviation alarms, if you have defined any. In the example above, channels Ch 1, Ch 2 and Ch 3 are linked to the 'Freezer 1' deviation alarm, while channels Ch 4, Ch 5 and Ch 6 are linked to the 'Freezer 2' alarm. All six channels belong to the data logger called 'Logger 1'.

A tick in a box shows that a channel is active. Click any channel to activate or deactivate it. As a short cut, you can click a single box to activate or deactivate all channels linked to a particular deviation alarm or a particular data logger.

Group

Use this drop-down list to save and restore named groups of parameters. To save the current parameter selection as a group, type the group name and click the Save group button.

To select a saved group, click the drop-down arrow and then click a group name.

To modify an existing group, make the changes to the parameter selection, then type the group name and click Save group.

To remove an existing group, deactivate all parameters, type the group name and click Save group.

See also: the Graph options 12 dialog, in which you can specify that parameters should be divided into a number of separate graphs, one for each group.

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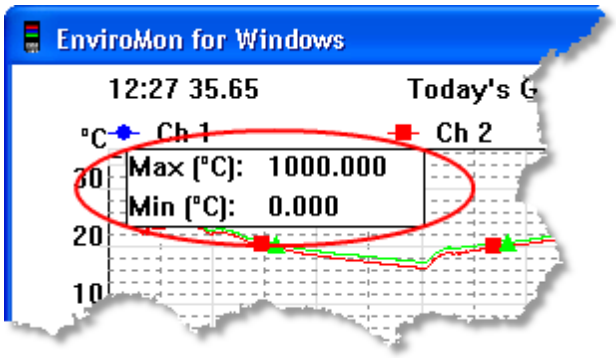
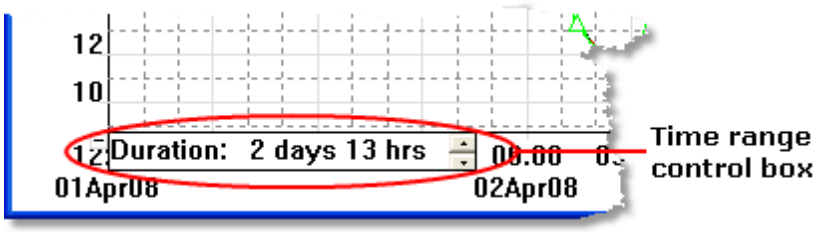
2.3.6.3 Axis control buttons

The axis control buttons appear in the Graph window[10].

- Vertical axis control button. Opens a text box in which you can type the maximum and minimum values for the vertical axis. These must be within the range of acceptable values for the sensor. Click the − button to apply the values and close the text box.



- Horizontal axis control button. Opens a text box in which you can type the scale of the horizontal (time) axis. You can also use the up and down spin buttons to change the value. The time can be set in hours or days, or a combination of both. Click the − button to apply the values and close the text box.



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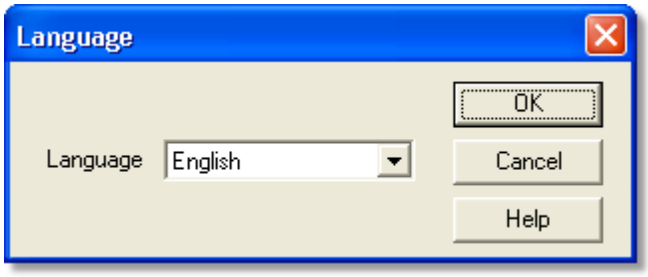
2.4 Miscellaneous settings

2.4.1 Language dialog

Where to find it: Settings | Preferences | Language

This dialog is used to select the language that EnviroMon and the logger will use.

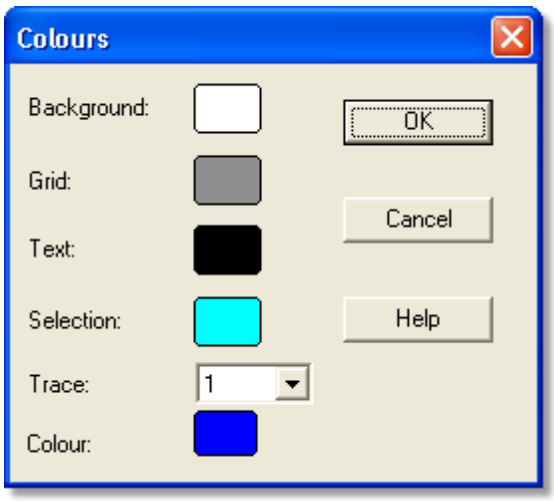


You must reprogram the logger using the quick configuration wizard 68 after changing the language, otherwise the computer will give an 'Incorrect configuration' message every time the program is run.

2.4.2 Colours dialog

Where to find it: Settings | Preferences | Colours

This dialog is used to specify the colours for background, text and other items in the Graph 10 and Spreadsheet 14 windows.



To change a colour, click one of the coloured boxes. This will open up a standard Windows colour palette. Select the colour you want from there.

Background.	The colour for the background on graphs, and for the readings on spreadsheets.
Grid.	The colour for the grid lines on graphs.
Text.	The colour for text.
Selection.	The colour for selected readings on spreadsheets.
Trace.	The graph can display up to 60 traces. Select a trace number, then click the coloured box and select a colour from the Windows palette.

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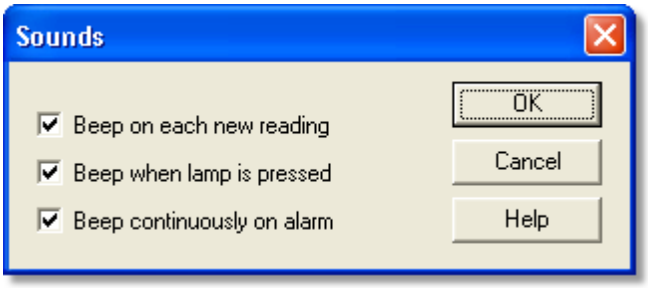
2.4.3 Sounds dialog

Where to find it: Settings | Preferences | Sounds

EnviroMon can make a sound when certain events occur. This dialog allows you to enable the sounds for each event.



Beep on each new reading. This option is useful if there is a problem and you need to keep a close eye on it. If you select a graph or spreadsheet window, the computer beeps each time a new reading is added to the graph or spreadsheet.

Beep when lamp is pressed. When there is an alarm, the lamp on the monitor window turns red. You can click the mouse button on the lamp to cancel the alarm. When this option is selected, the computer beeps when you click on a lamp to confirm that it has accepted your request.

Beep continuously on alarm. When this option is enabled, the computer produces a continuous tone while an alarm is active. This is useful if the computer is not in the same room as the logger.

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2.5 How to...

2.5.1 How to set up a scaling table

EnviroMon supports scaling for the EL016, EL036 and EL037 converters.

Scaling is done using a look-up table: a list of pairs of values, where each pair is made up of a raw value (in millivolts, unless the signal conditioner measures something different) and a scaled value in the appropriate parameter units.

For a sensor with a linear response, exactly two pairs (or points) are required: ideally, the top and bottom of the measured range. For a sensor with a nonlinear response, more points will be required.

Note: A large number of points may cause memory shortage problems in EnviroMon.

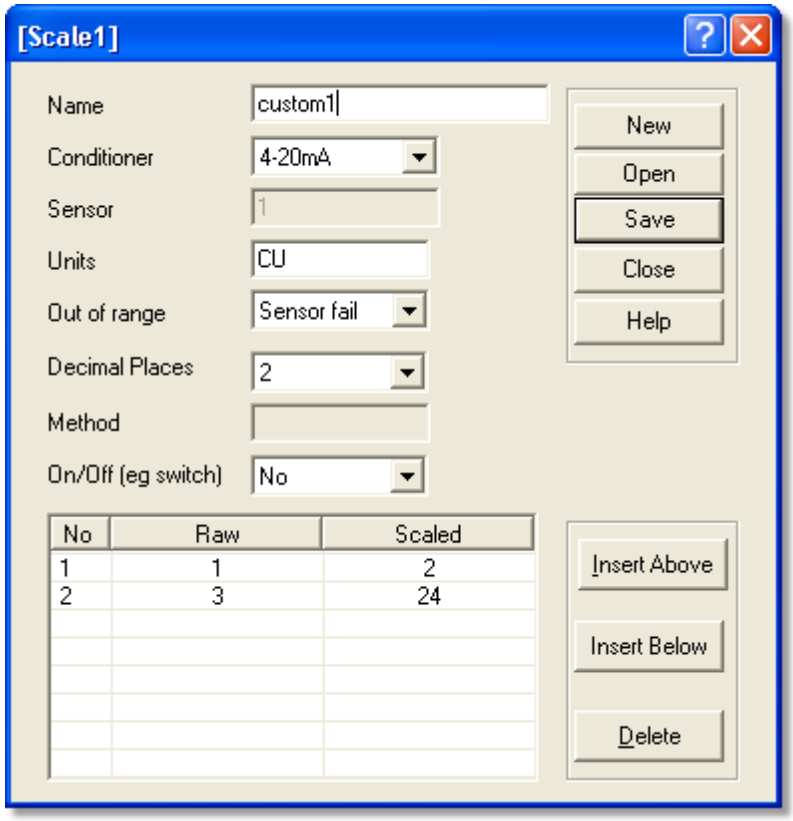
There are two ways to set up a scaling look-up table:

- Use the Scale 82 dialog. This is the easier method, and is recommended for most situations.
- Manually create a user scale file 26, USER.PSC. This method is required only in special situations.

Whichever method you use, the scaling information will be preserved during software upgrades.

Working with user scaling tables

1. Begin by creating a user scaling table. In this example, we have used the Scale 82 dialog to create a scaling table as follows:



The name 'custom1' is an arbitrary name for this scaling table. We will use it to refer to the table in a later step.

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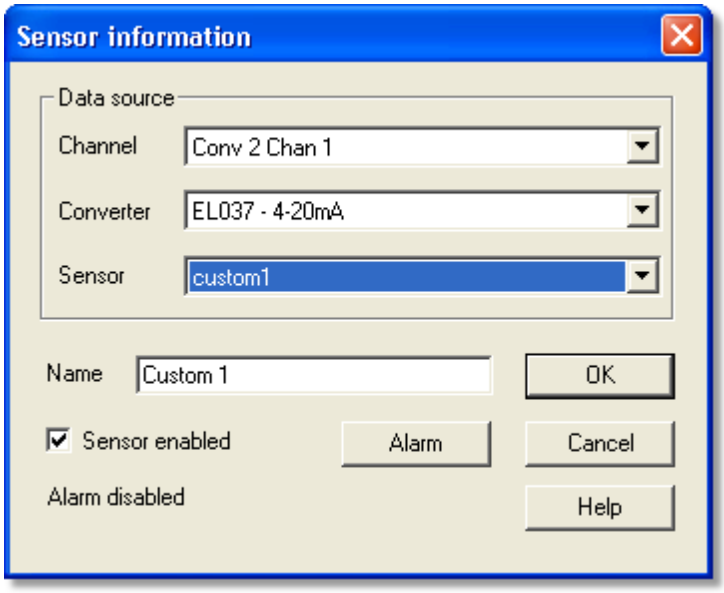
2. Ensure that you have a converter attached that supports scaling - for example, an EL037.

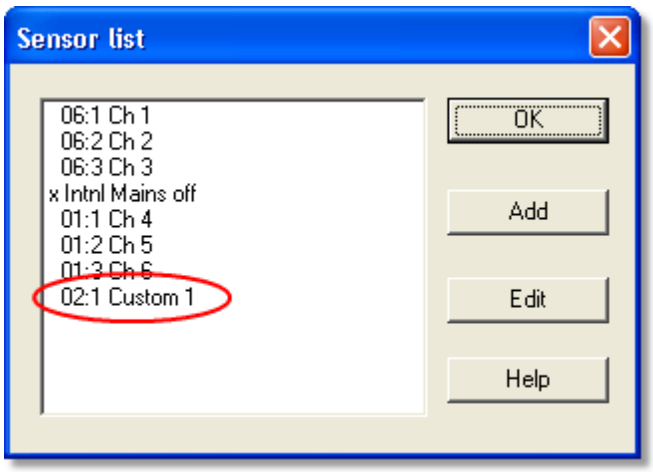
3. Open the Sensor list dialog by clicking the Locations button on the Configuration control panel.

4. Click Add to open the Sensor information dialog and add a sensor:



Set Channel to the converter channel that you wish to use. Set Converter to the type of converter that you are using. If the converter has more than one sensor option, select the one that matches the sensor type that you specified in the scaling table - in this example, '4-20mA'. Set Sensor to the name of the new scaling table that you created - in this example, we called it 'custom1'. Give the scaled sensor a name - in this example, 'Custom 1'.

5. Click OK in the Sensor information dialog to return to the Sensor list dialog, which will now show the new, scaled sensor:



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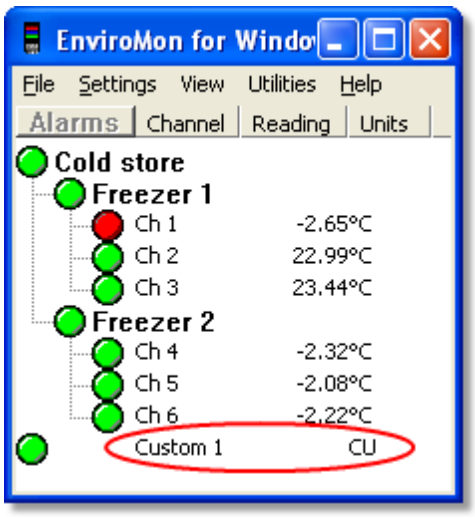
6. You now have a new, scaled channel called 'Custom 1' that will appear in the Monitor window like this:



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2.5.1.1 How to supply a user-defined scaling file

The easiest way to create a scaling table[23] is to use the Scale[82] dialog. However, you can also manually create the user scale file, USER.PSC. The scale file will be preserved during software upgrades.

You can copy an entry from one of the standard .PSC files to USER.PSC, then make changes as required. Remember to change the 'Sensor number' to a value in the user range (1-99) so that it does not clash with the entry that you copied. You can edit .PSC files using the Windows Notepad program.

The EnviroMon software applies scaling using a lookup table - a list of pairs of values, where each pair is made up of a raw value (in millivolts, unless the signal conditioner measures something different) and a scaled value in the appropriate parameter units.

For a sensor with a linear response, exactly two pairs (or points) are required; ideally, the top and bottom of the measured range. For a sensor with a nonlinear response, more points will be required. A large number of points may cause memory shortage problems in EnviroMon.

Below is an example of a scaling file which you can copy into your own USER.PSC and modify as desired. Each entry is explained below the example.

For each scale that you require, there is a section like this:

```
[Scale1]
Name=Honeywell 26PC 0-5psi
Conditioner=15
Sensor=121
Units=psi
OutOfRange=2
Places=3
Method=0
NoOfPoints=2
Raw1=0
Scaled1=0
Raw2=100
Scaled2=5
```

`Name=Honeywell 26PC 0-1psi`
The name of the scaling method. The same scaling method could be used for multiple sensors (in this case, for example, the pressure from a number of different sensors of this type).

`Conditioner=15`
The type of conditioner that the sensor will work with. If this sensor does not require a signal conditioner, set the conditioner type to zero.

For the the 0-2.5 V channel on the EL037 V/A converter, set `Conditioner=371`, for the 0-10 V channel set it to `372` and for the 4-20 mA channel set it to `373`.

`Sensor=121`
A unique reference for this scaling method. If you add your own sensors, use sensor numbers in the range 1 to 99.

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`Units=psi`	The units appear next to the parameter value on graphs, reports etc.
`Places=3`	The number of decimal places. The options are 0, 1, 2 and 3. With `Places=1` the value 15 would be displayed as 15.0. With `Places=2`, the same number would appear as 15.00.
`Method=0`	The scaling method. This must be 0 (table lookup).
`Onoff=No`	For numeric parameters, set `Onoff=No`. For parameters that can have only two values (on or off), set `Onoff=Yes` and adjust the scaling so that for `Places=1`, on = 100 and off = 0. The logger will then display On or Off for the parameter, and reports will show the percentage of time that the parameter was On.
`OutOfRange= 0`	Specifies what to do if the raw value is outside the range of the table lookup. The options are: 0 - treat as a sensor failure 1 - clip the value to the minimum or maximum table value 2 - extrapolate the value using the nearest two table entries
`NoOfPoints=2`	The number of table lookup points.
`Raw1=0` `Raw2= 16.7`	The raw values for the first and second points. The raw value is normally in millivolts, but for the CM007 (4-20 mA) conditioner, it is in milliamperes.
`Scaled1=0` `Scaled2=1`	The scaled values for the first and second points (`Raw1` corresponds to `Scaled1`, etc.) Values are in the units specified by the `Units` parameter.

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2.5.2 How to transfer data to other applications

How to export historical data as text

You can export graphical data in the following ways:

- By copying data from the spreadsheet window (to the clipboard)
- By writing data from the spreadsheet (to a disk file)
- By writing data directly to a comma separated value (CSV) disk file (using Command line data export 39)

The first two methods are useful when you want to browse through the data in the spreadsheet window and then write small amounts of data to a text file.

The command line function more complex, but has the following advantages:

- It gives you much more control over the range of data to be exported
- It works well even with large amounts of data
- You can set up a script to automate the export of data to a text file

How to export historical data as graphs

You can export text data using the following methods:

- Copying the data from the graph window (to the clipboard)
- Writing data from the graph (to a disk file)
- Writing data directly to a BMP or JPEG disk file (using Command line data export) 39

The first two methods are useful when you want to browse through the data in the graph window and then write one image to the clipboard or a text file.

The command line function is less intuitive, but has the following advantages:

- It gives you much more control over the range of data to be exported
- You can set up a script to automate the export of data to a JPEG file

Current data

There are two ways to transfer the current set of values to another application:

- Use DDE (Dynamic Data Exchange) 115
- Write the current readings to a file (see `CurrentFile` parameter in Envimon.ini 109)

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2.5.3 How to set up a deviation alarm

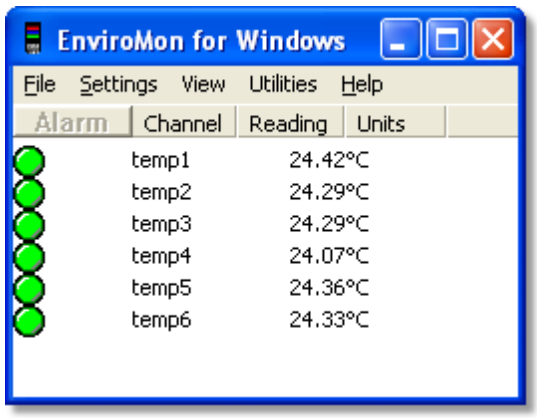
A deviation alarm instructs EnviroMon to alert you when the readings from two or more channels differ by more than a specified amount. (See: What is a deviation alarm?) You will need an EL042 alarm & relay unit in order to use this feature.

To set up a simple deviation alarm, proceed as follows:

1. Set up the system using the quick configuration method 68. In the following example we shall use a system consisting of the following equipment:

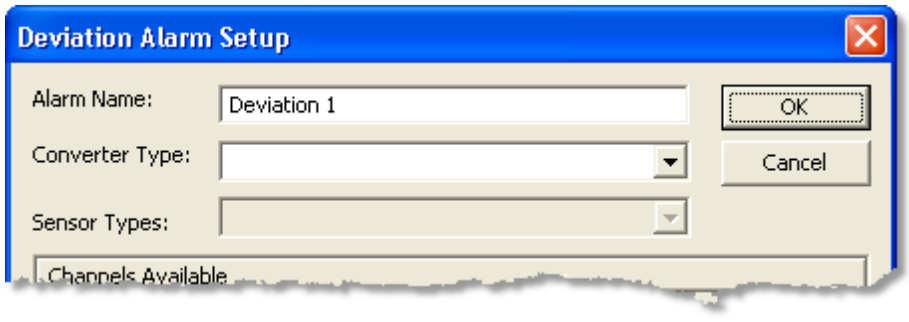
   - 1 x EL005 data logger
   - 2 x EL001 triple temperature converter
   - 6 x EL015 temperature sensor
   - 1 x EL042 alarm unit/dialler adaptor

   When this system is initially set up, the Monitor window 7 should appear as follows:



2. Go to Settings | Configuration | Change | Advanced and click the Deviation Alarm button. This will open the Deviation Alarm 96 dialog, as shown below:

3. Double-click 'Deviation Alarm 1' to open the Deviation Alarm Setup 97 dialog, which will look like this:



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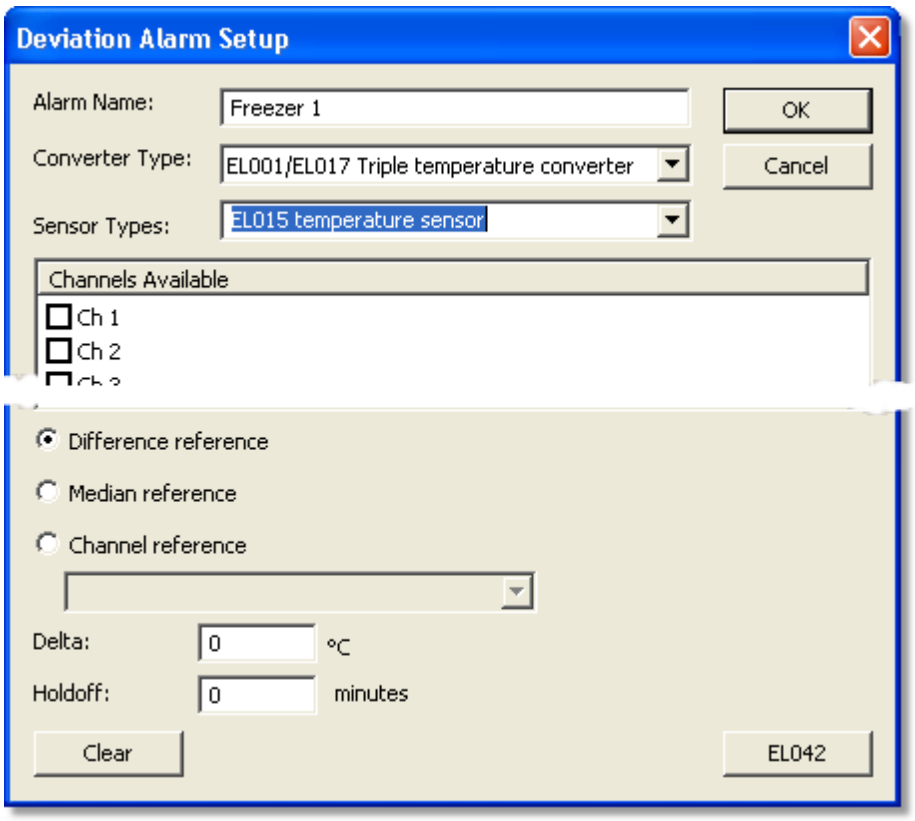
4. Type a name for the deviation alarm, such as 'Freezer 1', in the Alarm Name box.

5. Select the Converter Type that you are using for this deviation alarm from the drop-down list. All channels in a deviation alarm must be associated with the same type of converter. In our example, the converter type is 'EL001/EL017 Triple temperature converter'.

6. Select the Sensor Types from the drop-down list for the channels that you wish to use in the deviation alarm. All channels in a deviation alarm must be associated with sensors of the same type. In our example, the sensor type is 'EL015 temperature sensor'.

   The Deviation Alarm Setup dialog will now list the channels available, like this:



7. Tick the boxes next to the channels you wish to use in the deviation alarm. In this example, we will use channels 1 to 3. We are going to use difference reference mode, so leave the Difference reference option selected.

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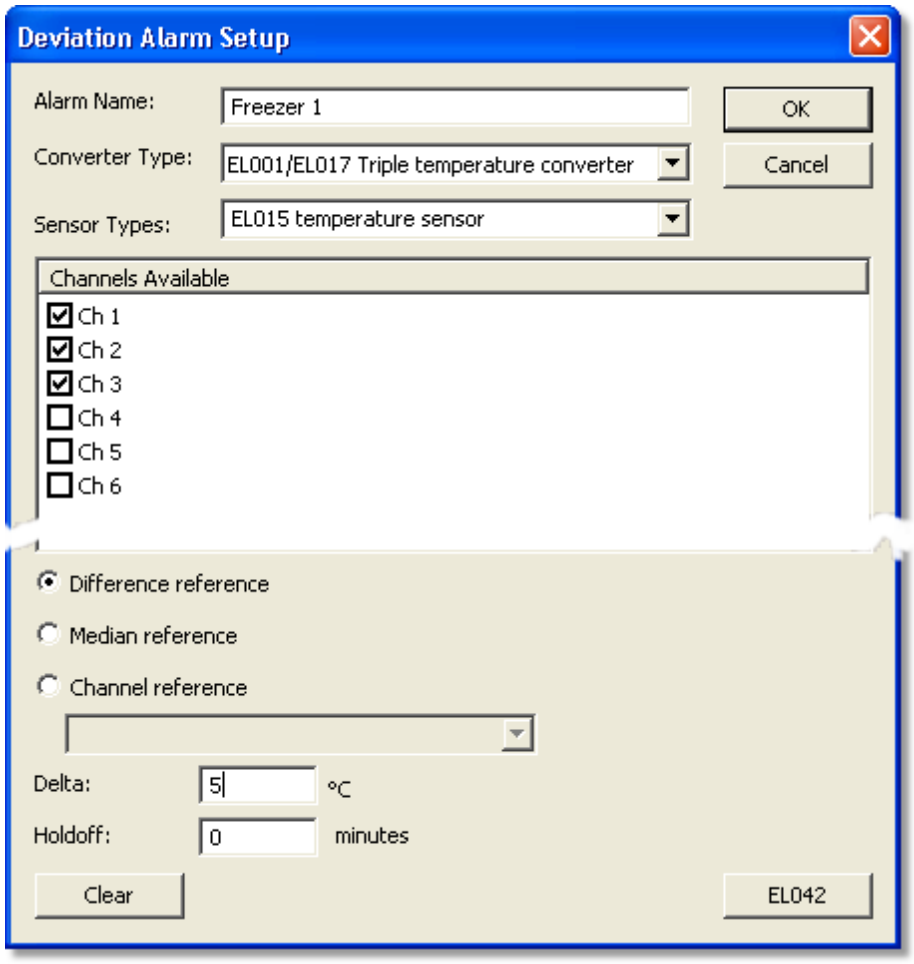
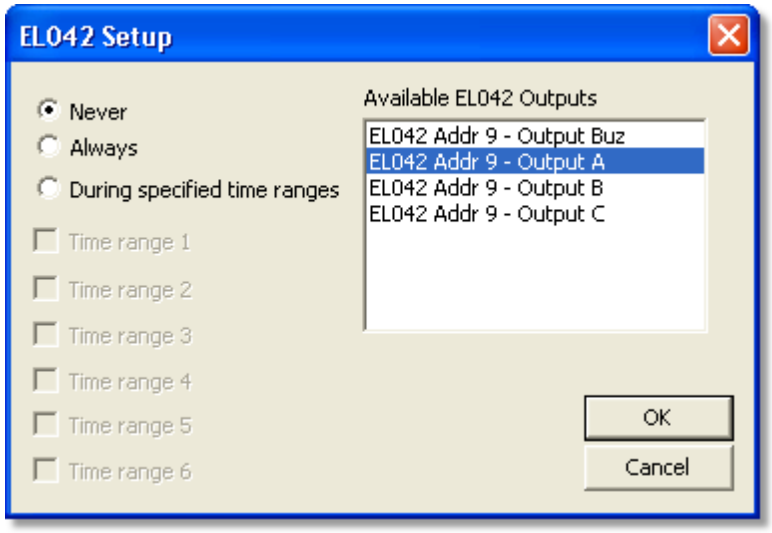
8. We require the deviation alarm to activate whenever two of our three selected channels differ by more than 5 °C, so type '5' in the Delta box. The dialog will now look like this:



9. To complete the setup, click the EL042 button to open the EL042 Setup 98 dialog, which will look like this:



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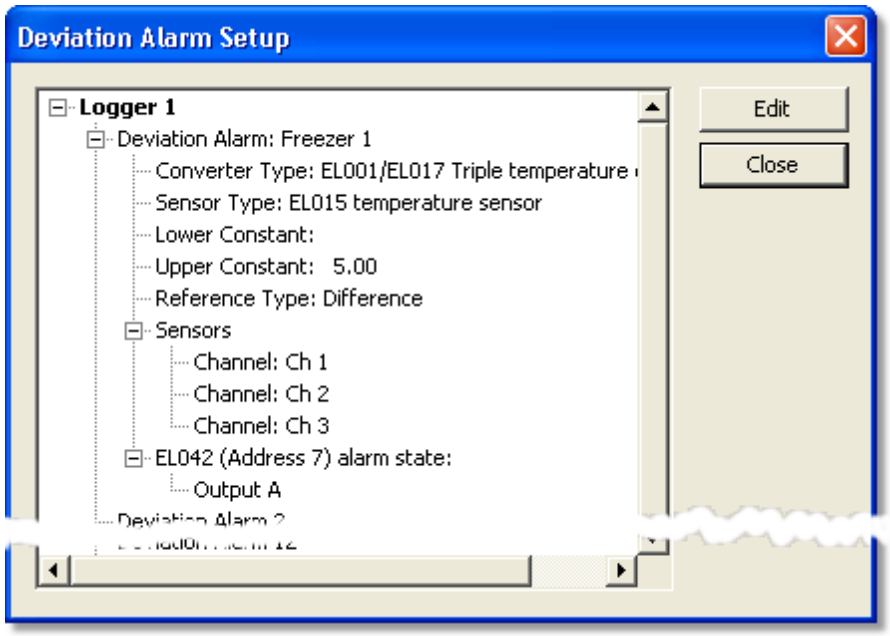
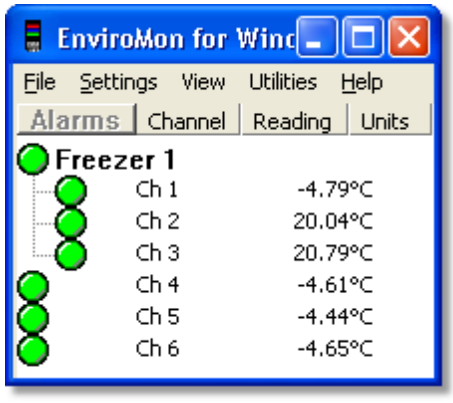
10. In the Available EL042 Outputs list, click the output or outputs that you wish to activate when the alarm is triggered. You must select at least one output, otherwise the Deviation Alarm Setup dialog will not let you continue.

11. You can select Never, Always, or During specified time ranges. Click OK to close the dialog and return to the Deviation Alarm Setup 97 dialog.

12. Click OK in the Deviation Alarm Setup 97 dialog to return to the Deviation Alarm 96 dialog. This will now show a summary of the deviation alarm settings, like this:



13. Click Close to return to the Configuration Control Panel 75, then click Program to store your changes in the data logger and Exit to return to the Monitor window 7. The Monitor window will now show a different view of the network, as shown below:



In the Monitor view above, channels Ch 1 to Ch 3 are now grouped under a new heading 'Freezer 1', which is the name of the deviation alarm that we have just set up. We now have an alarm lamp showing the status of the Freezer 1 deviation alarm, as well as three alarm lamps showing the status of the individual channels.

See also

- Setting up nested deviation alarms 33

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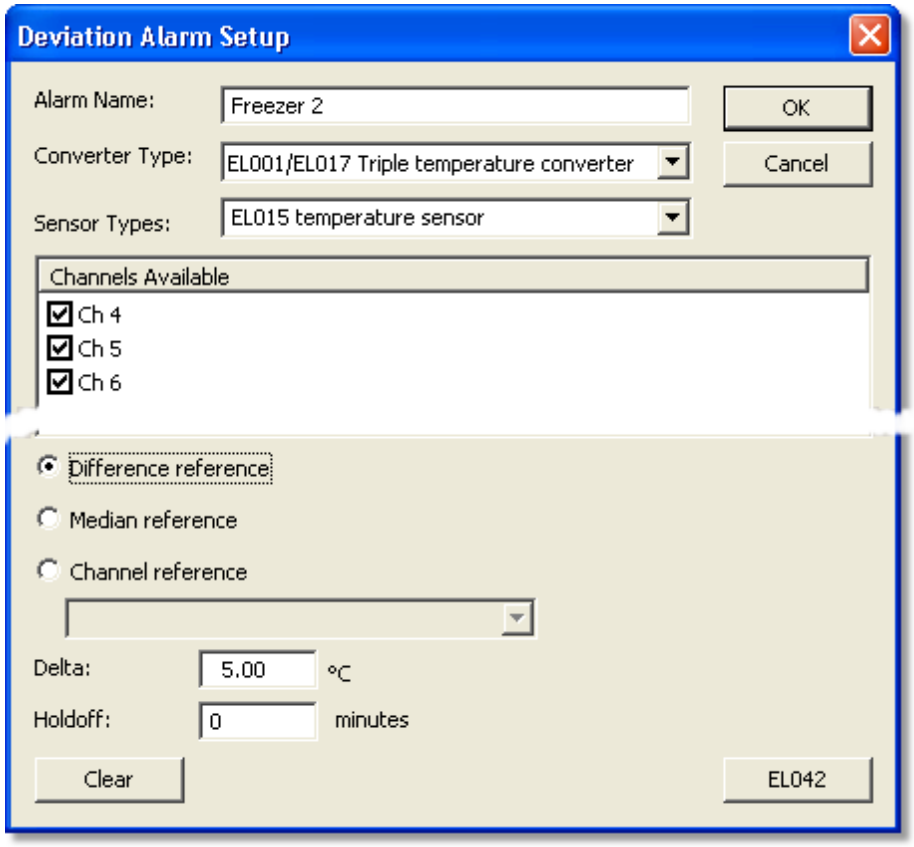
2.5.4 How to set up nested deviation alarms

Nested deviation alarms allow you to monitor a number of channels that already belong to one or more deviation alarms. (What is a deviation alarm?) When any two of the monitored channels differ by more than a specified amount, the top-level deviation alarm will be activated. You will need an EL042 alarm & relay unit to use deviation alarms.

1. To begin, follow the procedure in How to set up a deviation alarm 29. You should now have one deviation alarm configured.

2. Repeat the procedure to create a second deviation alarm called 'Freezer 2' using the remaining three channels, Ch 4 to Ch 6. The Deviation Alarm Setup 97 dialog for the second deviation alarm will look like this:



3. Close this dialog and verify in the Deviation Alarm 96 dialog that you now have two deviation alarms.

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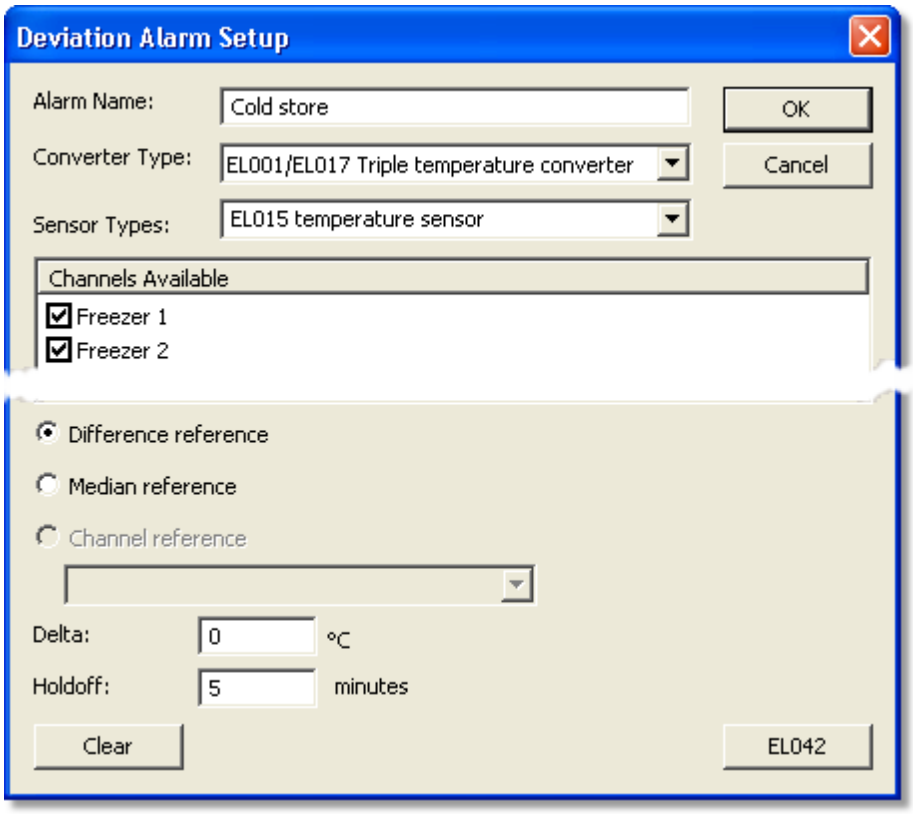
4. Set up a third deviation alarm, like this:



This Deviation Alarm Setup dialog lists the available channels. Channels Ch 1 to Ch 6 do not appear in the list, because we have previously assigned them to deviation alarms 'Freezer 1' and 'Freezer 2' and so they are not available. The only channels still available are the two deviation alarms themselves. We have typed in a new name, 'Cold store', for the new top-level deviation alarm, and ticked the boxes for 'Freezer 1' and 'Freezer 2'. This assigns all the channels in 'Freezer 1' and 'Freezer 2' to the 'Cold store' deviation alarm.

5. Click the EL042 button to select one or more alarm outputs to activate when the deviation alarm is triggered.

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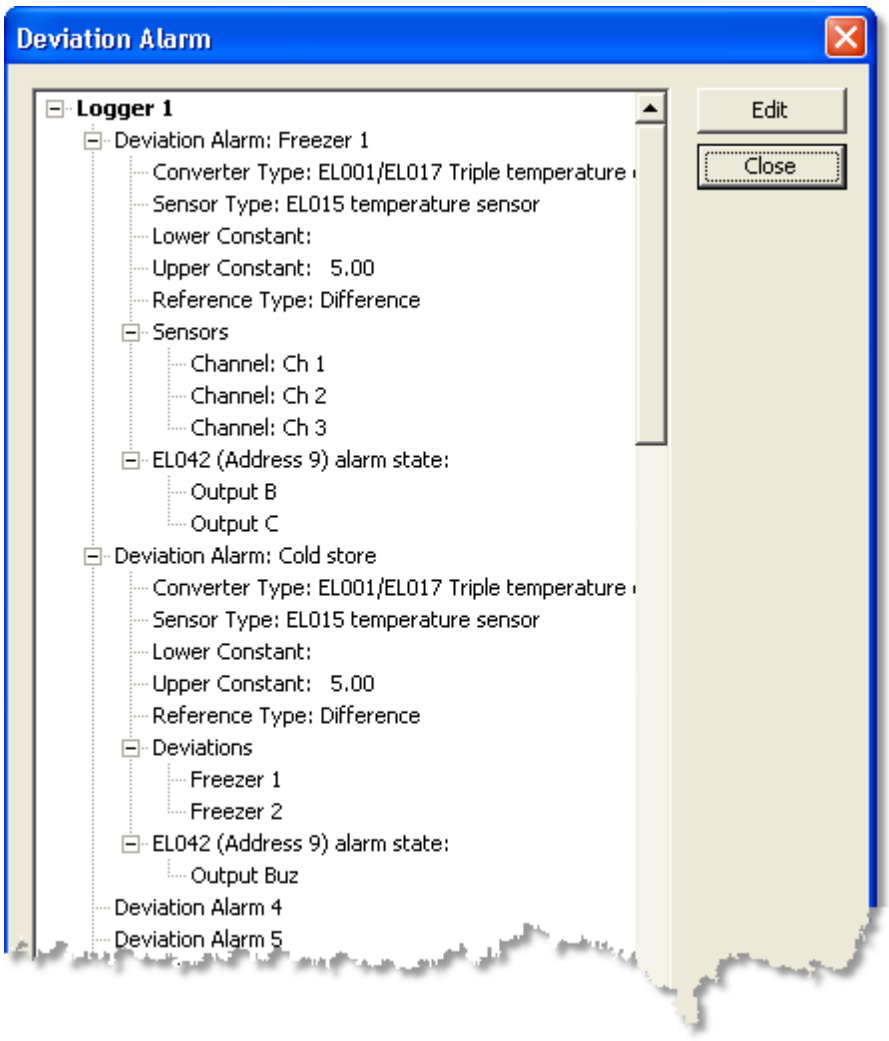
6. Click OK in the Deviation Alarm Setup dialog to return to the Deviation Alarm dialog, which will now show all three deviation alarms, like this:



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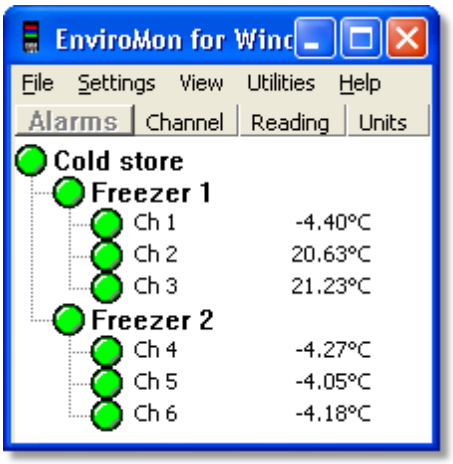
7. Close the Deviation Alarm 96 dialog and return to the Monitor window 7, which will now look like this:



The three columns of alarm lamps show that we have successfully set up some nested deviation alarms. The upper-level deviation alarm is called 'Cold store', and it contains all six channels from Ch 1 to Ch 6. The lower-level deviation alarms, 'Freezer 1' and 'Freezer 2', each contain three channels and operate as normal deviation alarms.

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2.5.5 How to display data on a web site

It is possible to display EnviroMon data on a web site. This feature could be used in several ways:

- To give access to EnviroMon data to several users within a company
- To provide customers with access to EnviroMon data
- To enable remote access (for example, so that you can check a system from home when an alarm occurs)

EnviroMon can be used in two different ways:

- A very safe method [37], where any computer can generate a fixed set of images and send them to a web server
- A more interactive method [38], where the EnviroMon software runs on the web server and dynamically creates images on request

The EnviroMon system generates only JPEG images or CSV text files, not the complete HTML text required for web pages. This means that you can easily design web pages tailored to your requirements, incorporating the images or providing 'download' buttons to get the CSV files.

The safe method does not require a permanent internet connection. It could connect to the internet via a dial-up line, or could be placed safely behind a firewall on a company network. It is also relatively easy to set up, as you only need to customise the simple example files to provide the images that you require. The EnviroMon software can run on any Windows computer, and the can send data to any web server (including an ISP's server).

The interactive version must have the EnviroMon software running on an Windows 32-bit machine that is directly connected to the Internet. You will need to be able to write HTML and CGI scripts to provide fully interactive operation.

2.5.5.1 Safe method

The files that were used to generate the dynamic web pages on the Pico web site (http://www.picotech.com/dynamic/) are available as samples. They are:

- `dynamic.html` - the HTML wrapper for the images
- `jpegs.bat` - a batch file to periodically generate images and send them to the web server
- `jpegs.ftp` - an FTP command file to send JPEGs and CSV files to the web site

You will need to customise these files to suit your own application.

- Modify the sample file `jpegs.bat` to produce the set of files that you require (see Command line data export [39]). Here is a typical example:

```
emw32 -d
emw32 -jtoday.jpg -rtoday,start+1day -gtemperatures
emw32 -jthisweek.jpg -rmonday,start+1week, -gmains
```

- Modify the sample HTML files to contain your company details, and references to the JPEGs that you want to display, and place the HTML files on your web server. Note: if you wish to restrict access to these web pages, you will need to add some sort of password access.
- Create a user account on your web server, and authorise the user to FTP data into the directory for the image files. If possible, ensure that this user account cannot modify any other directories on your server.

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- Modify the FTP control file `jpeg.ftp` with the name of your server, and the username and password.
- Manually run `jpegs.bat`.
- Check that it generates the required files.
- Check that the images were sent to the web server and are visible.
- Add entries to the Windows task scheduler to run `jpeg.bat` at the required times.

2.5.5.2 Interactive method

With the interactive method, the user can select any data, and the displayed data is always up to date. There are, however, some important considerations.

- Security, especially if the server can be accessed from anywhere on the internet
- Setup cost. You will need to write HTML and CGI scripts to enable authorised users to select the required data, and have a computer running permanently.

If you only require access from within a company network, this poses fewer security problems.

If you need to access the data from anywhere on the internet, you will need a server that is permanently connected to the internet. Given that the EnviroMon software must operate on a Windows computer, it is essential to position the server behind a firewall.

The following steps are required:

1. Set up a Windows computer that can be accessed from the required network.
2. Install a web server (an Apache server can be downloaded free of charge).
3. Write HTML text for the web pages.
4. Write CGI scripts that call emw32 to access the data.

You will need to arrange the download of data from the logger. This can be done in one of three ways:

- Have the EnviroMon software running continuously on the web server.
- Run the software periodically using the task scheduler to do an offline download.
- Do a download prior to every image file required.

For the second and third options, the following command is required:

```
emw32 -d
```

Each individual data request will require a call like this to generate a JPEG file:

```
emw32 -jfred.jpg -r01May02@00:00,08May02@23:59
```


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2.5.6 How to export data from the command line

This feature can be used to generate a JPEG image or a comma separated value (CSV) data file from stored EnviroMon data. This can be used for several purposes:

- To create image and data files whenever needed
- To automatically generate frequently used files at regular intervals
- To display data on a 'live' web site

To download data from a logger and then generate two data files, the following commands are required:

```
emw32 -d
emw -jmyfile.jpg -r20May02,27May02
emw -cmyfile.csv -r20May02,27May02
```

The first line downloads data from the logger. The subsequent lines each generate a specified JPEG file. Here is a full list of data export options:

`-d` Download data. This option does not require any further information. It must not be used at the same time as any of the file generation options.

`-j` Generate a JPEG file. This option is followed by a filename and up to three numbers. If a filename contain spaces, the entire option must be surrounded by quotes. For example:

```
-j"c:\Documents\Picture.jpg,400,300"
```

The numbers are:
width in pixels (default 640)
height in pixels (default 480)
image quality (default 75) - a higher number creates a better image, but a bigger file

`-c` Generate a CSV file. This option is followed by a filename.

`-r` Specify the time range. This option is made up of a start date/time and an end date/time, separated by a comma.

Important: the range must not contain any spaces.

The range can be specified as fixed dates (for example 20may02) or as relative dates (today). The latter is useful when you wish to automate the process of creating a standard set of JPEG images that reflect the current position.

A date/time must contain a date, and can also contain a time and an offset. If no time is specified, the time is assumed to be 00:00 (midnight). The following combinations are therefore valid:

```
date
date-offset
date+offset
date@time
date@time+offset
date@time-offset
```

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A date can be specified as one of the following:

`15Dec01` - day, month name and year
`today` - the current date
`monday` - the Monday preceding today (other weekdays are valid)
`first` - the first day of the current month.

A date and time can be specified as:

`now` - date and time now
`date` - assumes the time is 00:00
`date@15:00` - assumes 3pm on the specified date
`start` - the start date/time [valid only in end]
`end` - the end date/time [valid only in start]

An offset can be specified as a sign, a number and a keyword, for example `+2days` or `-1hour`. The following keywords are valid.

`minute` or `minutes`
`hour` or `hours`
`day` or `days`
`week` or `weeks`
`month` or `months`
`year` or `years`

`-g` Specifies what group of parameters to display. The groups can be defined using the Channels option on the graph or spreadsheet windows. If the group is blank, all channels are displayed. If the group is `monitor`, the program generates an image or CSV file for the monitor window. If the group name contains spaces, it must be enclosed in double quotation marks.

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3 Installation Guide

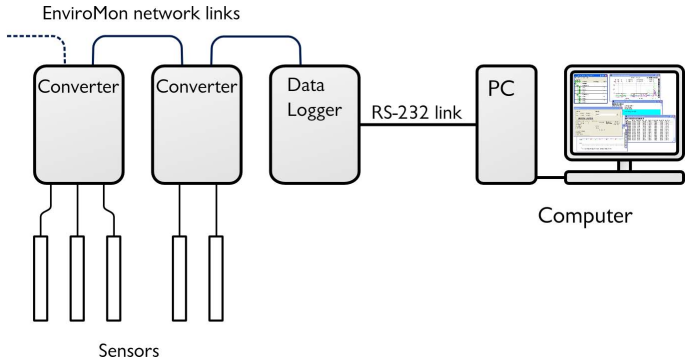
This section of the manual is aimed at installation engineers. If you wish to know how to use a pre-installed system, please see the User's Guide. 4

3.1 System overview

EnviroMon consists of the following items:

- Computer
- Logger
- Multiple converters
- Remote alarm units (optional)

The following diagram shows how a typical system is interconnected:



The EnviroMon PC application performs the following tasks:

- System configuration
- Long-term data storage
- Display, analysis and printing of recorded data

The internal battery backup ensures that the logger stores data continuously, even when the computer is turned off or disconnected or the mains (line) power fails. The data stored in the logger is automatically sent to the computer when the logging software is next started.

3.2 Equipment

The network is a four-wire cable which carries power and data between the logger, converters and optional equipment such as remote alarms. The logger can be attached anywhere along the network cable. The network will operate correctly with about 400 metres of standard network cable between the logger and the furthest converter, but this distance can be increased to a kilometre or more by using thicker cable.

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The network can be built in the following ways:

- Connect each converter to the next using EL003 network cables. Each cable is 5 metres long, so the units must be within 5 metres of each other.
- Make up longer versions of the network cable, then connect each converter to the next using these cables (you will need a crimp tool, available from Pico, to attach the plugs to the cables).
- Install a fixed cable around the site with an EL009 telephone wall-socket at each point where a converter or logger is to be installed, then connect the logger and converters to the wall-sockets using 5-metre EL003 network cables.
- Install a fixed cable directly between converters. This is necessary with devices that are fitted with screw terminal blocks, such as the alarm relay, dialler, and network junction box.

3.2.1 Logger

3.2.1.1 EL005 logger

The EL005 logger has no display or buttons, so it can only be used with a computer. It also has no internal alarm, so if you need an audible alarm, connect an EL006 audible alarm unit or EL042 alarm & relay unit to the network.

Specifications

Sampling rate	1 to 240 minutes per sample
Max. readings	250,000
Max. no of converters Max. no of sensors	10 40
PC connection	Serial port
Power supply	12 V DC unregulated, or 14 to 18 V DC regulated
Battery backup	Internal rechargeable cells

Connections

The logger has four sockets on one end:

- A round DC power socket. The cable from the mains adapter supplied with the logger plugs in here.
- Two square network sockets.
- A D-shaped serial port socket which connects either to a computer serial port or to a printer using the serial port adapter supplied.

The logger also has a red light next to the serial port.

Batteries

The EL005 logger has internal rechargeable batteries. These are kept topped up while mains power is available, and can preserve data for 72 hours during a mains power failure if logging is disabled. With logging enabled, run-time on batteries is up to 6 hours in low-power mode (sleep between samples) and up to 3 hours in normal mode (continuous logging) under ideal conditions. The EL018 dialler adapter/battery backup unit can provide power to the system for much longer periods in the event of mains failure.

The unit switches to battery power as soon as the mains power is disconnected, so it will take some time for the batteries to recharge after a long period without mains power.

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LED

When the unit is first powered on, the red light comes on continuously while it carries out a self-test. If the unit is not configured, the light flashes at a uniform rate, once per second. If the unit is configured, the light shows traffic on the EnviroMon network, normally by a sequence of very short flashes every three to five seconds.

3.2.1.2 Logger internal parameters

The logger can record the following internal parameters:

- Estimated mains voltage
- Network current
- Date
- Time

The estimated mains voltage is a very rough measure - within about 20% - but readings for a particular logger and power supply will be consistent. There are two parameter options - one for 110 V operation and one for 240 V operation.

The network current gives an indication of the current supplied to all of the converters on the network. It should not exceed 100 mA.

The EnviroMon software assumes that the date and time of the computer are correct, and stores data using this information. Unfortunately, some computer clocks are not always reliable. The date and time parameters can be used when you need to be certain that a given data item was recorded at the date and time specified. The date and time are stored by the logger as parameters at the time the reading is recorded.

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3.2.2 Converters

3.2.2.1 Introduction

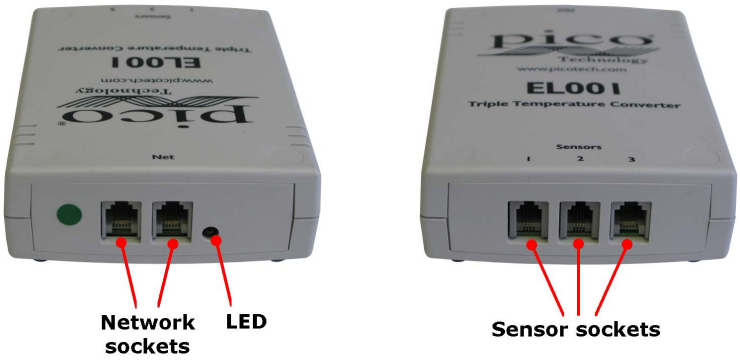
A converter samples the output of sensors connected to it and gives these samples numerical values. The numbers then go to the logger that is connected to the converter.

Each converter has an address that identifies it to the logger. Most converters are supplied with the address set to 1. Use the Change converter address 66 program to change the addresses so that each converter has a unique number.

You can have up to 10 converters for each system using a mix of standard, humidity or voltage converters.

3.2.2.2 EL001 temperature converter

The EL001 has three narrow sockets for sensors at one end. At the other end there are two wide sockets for the network, and a red LED.



The LED flashes continuously immediately after the system is turned on. Once the system is running normally, the light goes out and then flashes briefly each time the converter takes a reading.

Each converter has an address - a number between 1 and 15 - that must be unique on the network. The converter will already be programmed with an address, but you can change this through the installation software.

When you install the system, the logging software will ask you for the address number and where each of the three sensors are which relate to that converter address. For large networks, it is best to make a plan of the layout before starting installation.

The three sensor sockets are marked with channel numbers.

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3.2.2.3 EL016 voltage converter

The EL016 voltage converter has eight voltage inputs. Each input can accept a voltage in the range 0 V to 2.5 V.

The voltage inputs connect to the EL016 through a D9 female connector. The following table shows the pin connections and channel numbers for an EL016 with address set to 1. 'A' will be address 1, 'B' will be address 2 and 'C' will be address 3.

Address	Channel	Pin
A	1	5
A	2	9
A	3	4
B	1	8
B	2	3
B	3	7
C	1	2
C	2	6
Ground		1

It is possible to display the voltages as other parameters - see the PSC file section of the signal conditioner help file for more information.

3.2.2.4 EL026 temperature and humidity converter

The EL026 needs to be calibrated for a specific EL030. (Calibrating humidity converters 67)

Specifications

Humidity	Range	0 to 95% non-condensing*
	Accuracy	±2.5% (0 to 90%)
	Response time	
	Vigorous Motion	~60 secs
	Still Air	~60 mins
Temperature	Range	0 to 70 °C
	Accuracy	±0.2 °C
Enclosure	Dimensions	130 x 60 x 30 mm
	Material	Black ABS NOT waterproof

* capable of measuring over 90% humidity for short periods

Each EL026 converter has an address between 1 and 15. If you wish to connect more than one converter to your logger, each converter must have a different address. If you have two converters with the same address, install the software on your computer and then use the Change address 66 command to change the address of one of the converters.

The sensor must be situated away from direct contact with water and away from sunlight. Temporary exposure to either is unlikely to damage the unit, but the unit will give incorrect readings while it remains exposed.

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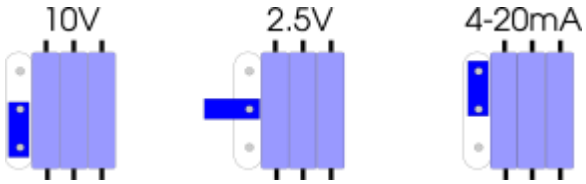
3.2.2.5 EL037 voltage and 4-20mA converter

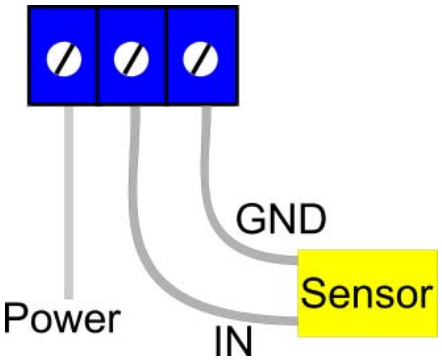
The EL037 has four inputs, and an external power input that can be used to supply power (perhaps 12 or 24 V, depending on requirements) to the sensors.

Range		
±2.5 V	15 bits + sign (40 µV per LSB)	±0.3%
±10 V	15 bits + sign (0.15 mV per LSB)	±0.5%
4-20 mA	15 bits (0.4 µA per LSB)	±0.4%

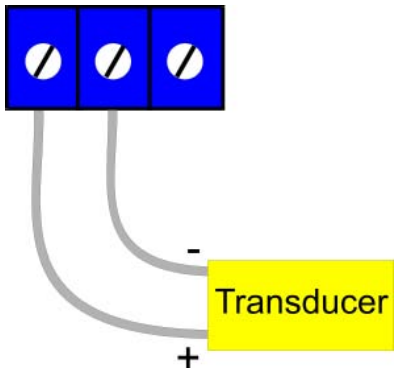
Each input can be configured using jumpers to accept either 2.5 V, 10 V or 4-20 mA. It can be configured for other voltage ranges and for resistance measurement with minor component changes. The following diagram shows how to set a jumper to select the input type for a channel:



When measuring voltages, or for measuring 4-20 mA with the transmitter supplying the loop current, the input is connected between IN and GND. The PWR connector can be used to supply power to the transmitter:



When measuring 4-20 mA with the EL037 supplying loop current, the transmitter should be connected like this:



NOTE: only 100 mA is available for the whole network. When using the PWR connector to supply power to the transmitter or to supply the loop current, it may be necessary to use the external power input.

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3.2.2.6 EL040 current monitor converter

The EL040 current monitor converter is intended for use with the TA011 current clamp (details) 60 or similar current transformers that are designed for AC current measurement.

The EL040 is a 3-channel device capable of monitoring three current transformers at the same time (the current monitoring kit 61 comes complete with 3 current clamps).

Current transformers require no power and are available in a wide variety of formats, from 200 A clamp-on units to 5000 A fixed-core transformers. These devices typically generate an AC signal of 1 mV for each ampere flowing through a cable. The EL040 allows these currents to be easily measured using EnviroMon.

Specifications

Number of Channels	3
Sensor required	TA011 current clamp or another suitable current transformer
Max input voltage	1 V AC RMS
Input impedance	> 1 MΩ
Frequency range	20 Hz to 1 kHz
Accuracy	±1% (0 to 200 mV) ±2.5% (200 mV to 1 V)
Operating temperature	-20 °C to 70 °C
Input connector	4 mm banana plug

Connections

Most current transformers are fitted with 4 mm banana plugs, so that they are suitable for use with multimeters. Connect the banana plugs on the current transformer into the banana sockets on the EL040. The polarity is not important. The current clamp should be clipped round a single core of the mains cable. It will not give correct readings if live, neutral and earth wires all pass through the current clamp.

Safety note: Current transformers are intended to simply clip round an insulated mains cable. It is not necessary to make an electrical connection to the conductor, and doing so may be dangerous. If you wish to work on uninsulated high-voltage cables, please check the suitability of the current transformer for this use.

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3.2.2.7 EL041 thermocouple converter

The EL041 thermocouple converter is a 4-channel unit intended for use with any conventional thermocouple of type B, E, J, K, N, R, S or T with a 'mini-thermocouple' connector. The EL041 is cold-junction-compensated for all types of thermocouple. The compensation can also be switched off for measuring a ±60 mV input signal.

Specifications

Number of channels	4
Thermocouples supported	B, E, J, K, N, R, S, T SE0xx Thermocouples 61
Voltage input range	±60 mV
Resolution	15 bits + sign bit
Accuracy	Thermocouples: ±(0.5 °C + 0.3% of type K reading) Millivolts: ±0.3%
Conversion time	1 second
Overload protection	±10 V
Input connector	Mini-thermocouple plugs
PC connection	via EnviroMon network
Operating temperature	0 °C to 70 °C (20 °C to 30 °C for quoted accuracy)
Operating humidity	25 to 75% RH

Note: The EL041 is designed to work only with the EL005 logger.

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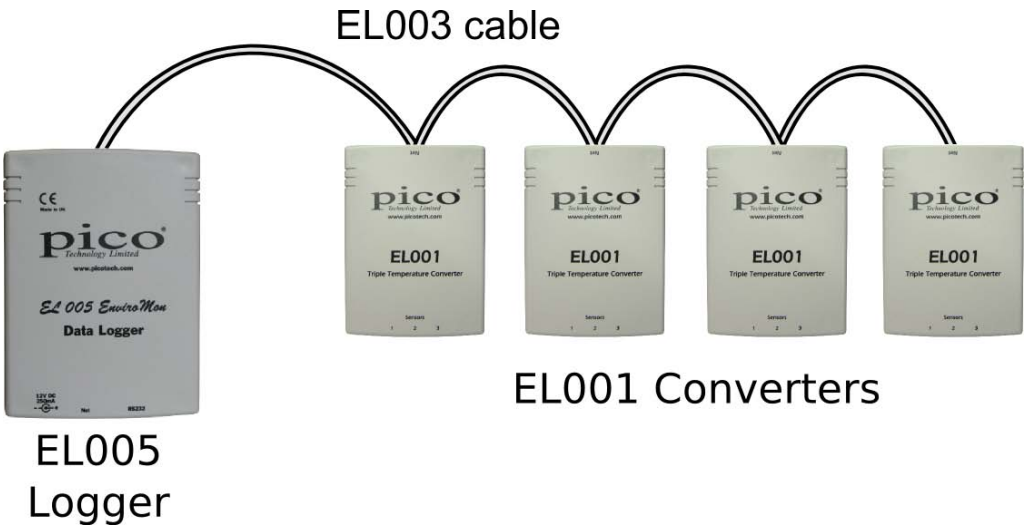
3.2.3 Connections

3.2.3.1 Types of network

Small network

For small networks - where all converters are within a 5 metres of each other - it is possible to put together a network using only standard network cables.

The logger and converters each have two network sockets. By connecting a network cable from one unit to the next you can build up a complete network.



Larger network

For larger networks, the same approach may be used. The network cables must be made up on site to the length required, using cable WI001 and connecting the CO018 connectors to the cable using a crimp tool.

In some circumstances it might be more convenient to use a spur cable to link some of the connectors.

Fixed network

For the largest networks, with a large number of converters or converters which are widely spaced, the most satisfactory installation is a fixed network. Place an EL009 wall-socket at each location where a converter or logger is required and use a standard 5-metre cable to connect the socket to the logger or converter.

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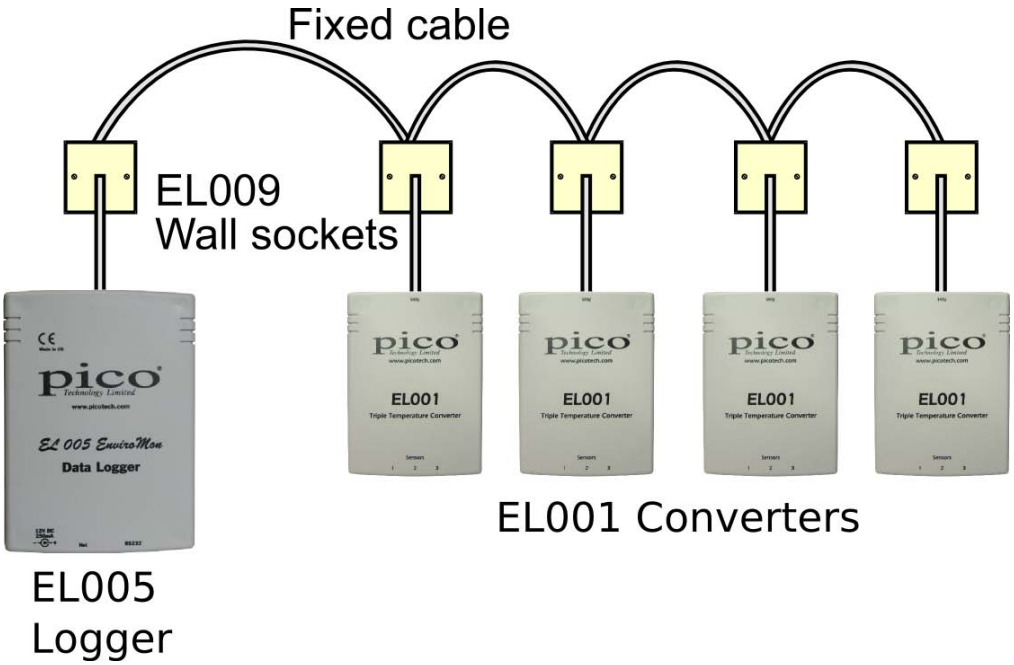
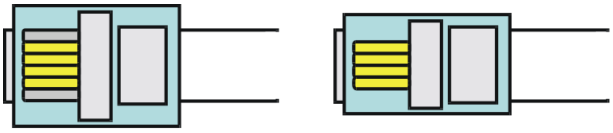


3.2.3.2 Connectors

It is very easy to set up a small system, as all of the parts connect together using telephone-style FCC68 connectors. To prevent incorrect assembly, the following two different types of connector are used:

- CO018 - a wide 6-way connector with four pins fitted and the outer two slots empty, used for network cables.
- CO017 - a narrow 4-way connector used for sensor cables.



CO018
Network connector

CO017
Sensor connector

3.2.3.3 Screw terminal connections

The following two EnviroMon devices are fitted with screw terminal blocks:

- EL018 dialler/battery backup unit
- EL021 network junction box

The screw terminal block connects the device to the network instead of using the telephone sockets. The connections linking the device to an EL009 wall socket are like this:

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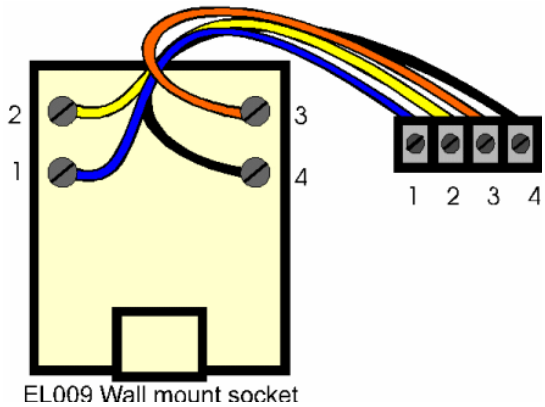


EL009 Wall mount socket

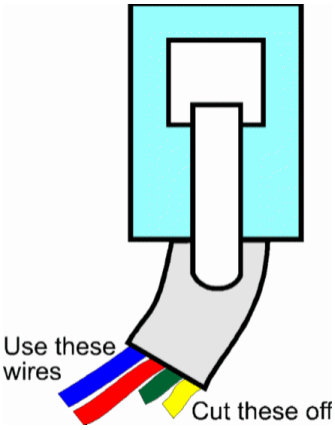
Connect adjacent units using four core cable, such as WI003. Connect terminal 1 to terminal 1, terminal 2 to terminal 2, and so on. The signals associated with each connection are as follows:

Connection	Signal
1	Data A
2	Data B
3	Power (12 to 18 V)
4	Ground

3.2.3.4 Sensor connections

If you need to connect flexible cable sensors to standard converters, proceed as follows:

1. Attach a sensor connector to a length of 4-core flat cable
2. Connect the two wires from the sensor to the left-hand two wires on the length of 4-core cable



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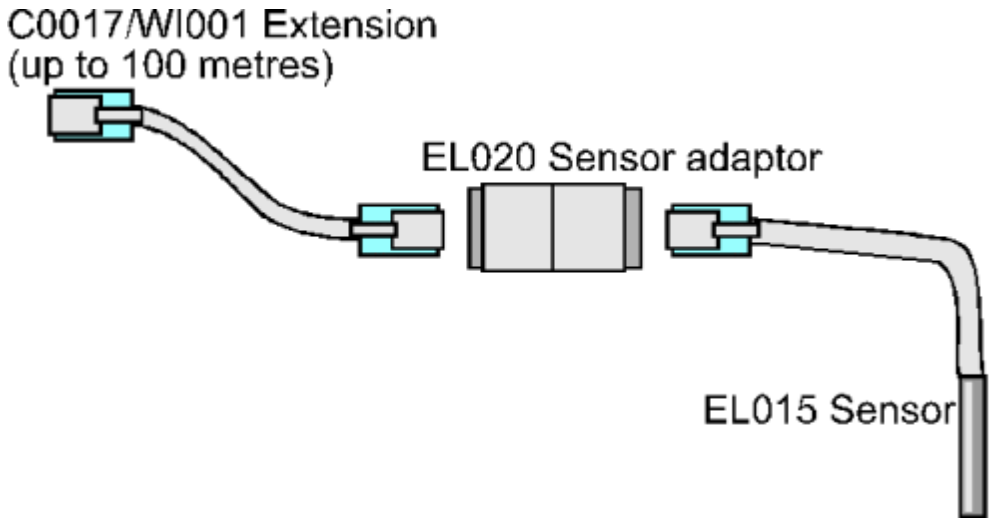
3.2.3.5 EL020 sensor adapter

The EL020 sensor adaptor has two sensor sockets back to back. If it is necessary to extend a sensor cable, it is easy to do so by making up a cable of the required length with plugs at each end, then using the EL020 to attach one end of this cable to the sensor cable.



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3.2.4 Alarm and output units

3.2.4.1 EL006 remote alarm

The EL006 remote alarm is useful when the room where the logger is located is not often occupied. One or more remote alarms can be connected at any place along the network where staff will hear the audible alarm.

The remote alarm looks like a standard converter, but has only the network sockets. It is connected to the system using two network extension cables.

3.2.4.2 EL018 dialler adapter and battery backup

The EnviroMon system with the EL018 dialler adapter/ battery backup unit is designed to operate with the Gardiner Technology Gardtec dialler or the Menvier Security SD1 speech dialler.

The dialler can be programmed with a list of emergency telephone numbers. When there is a problem, the dialler calls each of the telephone numbers in turn until someone answers, then it gives a message saying that there is a problem.

The dialler behaves in the same way as any normal extension and does not affect the normal operation of the telephone.

The dialler adapter serves three purposes:

- Controls the dialler
- Provides power for the dialler and for the system
- Is capable of providing battery backup for much longer periods than the logger's internal backup

The dialler adapter is supplied in a grey plastic box with a clear lid. The box has a large hole each side for cables. There is space for a 1.2 Ah battery, inside the box, that will provide backup for 12 to 24 hours, depending on the configuration. Alternatively the unit can be connected to a car battery, outside the box, that could provide backup for many days.

Safety note: When using an 1.2 Ah battery inside the box, do not attempt to seal the cable holes as this may cause an explosive build-up of gases inside the box.

The speech dialler can give 3 different messages for 3 problem types as follows:

- A - temperature out of range or sensor fail
- B - mains (line power) fail for more than 2 minutes
- C - network fail for more than 2 minutes

There is a separate wire between the adapter and the dialler for each problem. If you do not wish to have calls made about a problem, leave the wire unconnected.

There are 3 red lights, one for each problem, that are turned on when the problem is detected. There are 2 green lights: one for mains (line) power and one for battery power. When the mains power is on, the battery is kept charged up continuously and both the mains and the battery lights remain on.

There are 3 groups of screw terminals on the EL018:

- Backup battery
- Speech dialler
- Network (you can use the phone connector sockets if you prefer)

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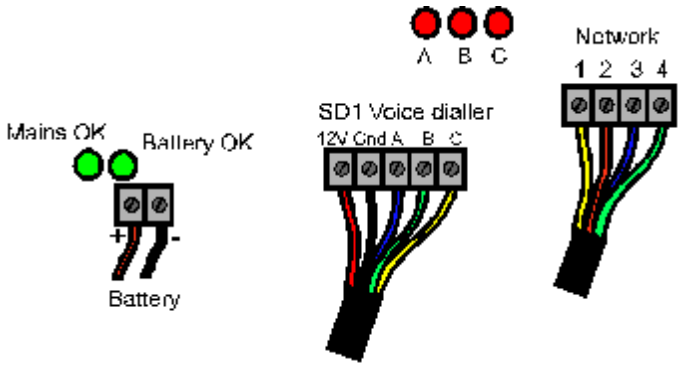
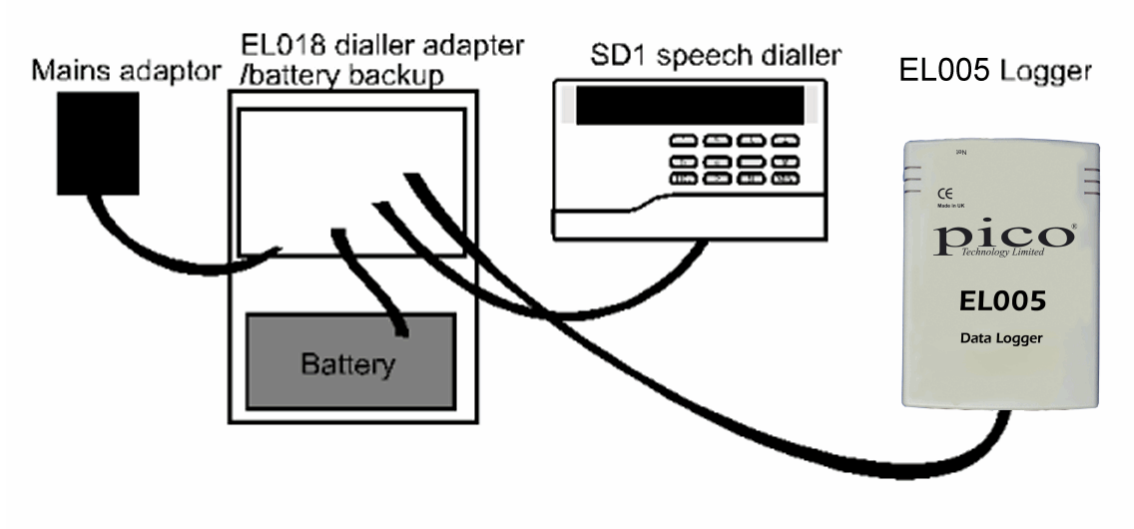
When using the EL018 with the EL005 42 logger, plug a mains adapter into both the EL005 and the EL018.

The connectors and lights on the EL018 are arranged as follows:



EL018 Dialler adaptor/battery backup

When it is wired into the system, it will look like this:



Similar products

- EL042 alarm & relay unit 55

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3.2.4.3 EL042 alarm & relay unit

The EL042 alarm & relay unit has two modes of operation:

- EL042 independent mode 57. In this mode the unit provides three opto-isolated switches and an audible alarm. It can also be used with the deviation alarms in the EnviroMon software.
  In this mode the unit can be powered from the network (which also recharges the internal batteries). If the network power fails, the unit will continue to operate from the batteries for several hours. This will allow already-activated alarm conditions (activated before the network power failure) to be maintained. Alarms cannot be set or cleared until the network is operating again.

  A 12-volt supply is available to power external equipment up to a maximum of 30 mA (200 mA if the external 12-volt power adaptor is used).

- EL018/EL006 emulation mode 56. In this mode the unit can drive the autodialler to provide one of three predefined messages depending upon the alarm status.
  In this mode we recommend that the unit is powered from the external 12-volt power adaptor to provide sufficient power for the autodialler. Otherwise, the network will power the autodialler but, depending upon the type of autodialler and the number of converters on the network, there may be insufficient power on the network. When the external power supply and network power both fail, the batteries will provide power for the dialler for several hours.

LED status

When the unit powers up, the LED starts to flash. Once it has received a valid message from the logger, the LED goes on continuously. If there is an alarm condition, the LED flashes a number of times every five seconds to signal one of the following alarm conditions:

- 1 flash – sensor alarm condition raised by logger
- 2 flashes – mains (line) fail; only if external mains adapter fitted
- 3 flashes – network failure

EL018 emulation

The EL042 can be programmed to emulate the EL018 dialler adapter/ battery backup 53 and EL006 remote alarm 53 units. See: Emulating the EL006 and EL018 59.

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3.2.4.3.1 EL042 in EL018/EL006 emulation mode

The EnviroMon system with the EL042 55 in EL018 53/EL006 emulation mode is designed to operate with the Gardiner Technology Gardtec dialler or the Menvier Security SD1 speech dialler.

The dialler can be programmed with a list of emergency telephone numbers. When there is a problem, the dialler calls each of the telephone numbers in turn until someone answers, then it gives a message saying that there is a problem.

The dialler behaves in the same way as any normal extension and does not affect the normal operation of the telephone.

The dialler adapter serves three purposes:

- Controls the dialler
- Provides power for the dialler
- Provides battery backup, if needed, for much longer periods than the logger's internal backup

Safety note: The dialler adapter has a row of holes in the end of its case for ventilation. Do not block these holes, as this could cause the unit to overheat, leading to equipment damage or a fire.

There is a 4.8-volt rechargeable battery pack inside the box that will provide backup for 12 to 24 hours, depending on the configuration.

The speech dialler can give three messages for different types of problem as follows:

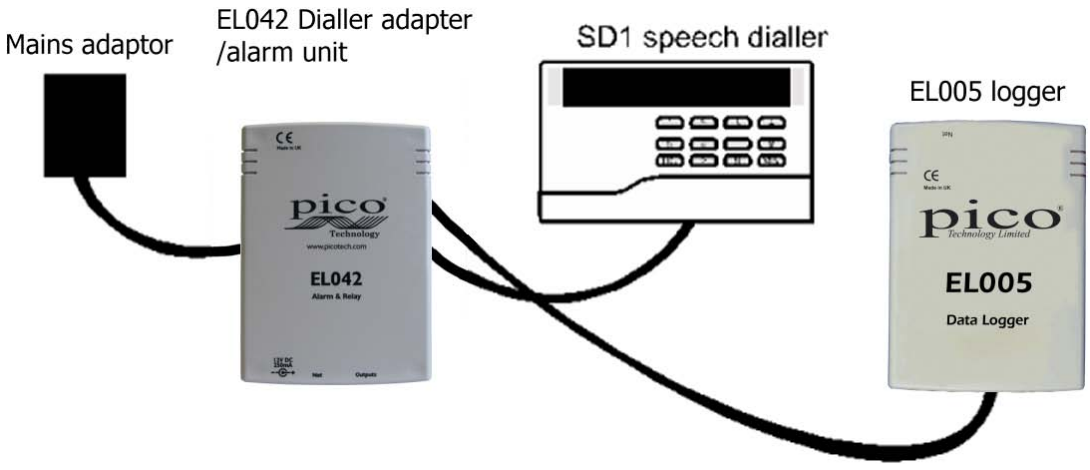
- A - temperature out of range or sensor fail
- B - mains fail for more than 2 minutes
- C - network fail for more than 2 minutes

There is a separate wire between the adapter and the dialler for each problem. If you do not wish to have calls made about a problem, leave the wire unconnected.

The red lamp on the EL042 flashes once a second to indicate that the unit is functioning.

See also: Connector pin-out 58.

When the EL042 is wired into the system, it will look like this:



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Alarm conditions

Sensor alarm. A sensor alarm activates Output A (see pinout 58) and the audible alarm. This type of alarm is raised if the logger sends an 'alarm on' message. The message will be repeated every sample interval. The alarm remains active until the logger sends an 'alarm off' message. The alarm mode can be disabled by the logger.

Power supply fail alarm. A power supply fail alarm activates Output B (see pinout 58) and the audible alarm. This type of alarm is raised if the external 12-volt power adaptor fails (due to a mains failure) for a given duration as set by the logger. The alarm condition goes away immediately when the external power returns. The alarm mode can be disabled by the logger.

Network fail alarm. A network fail alarm activates Output C (see pinout 58) and the audible alarm. This type of alarm is raised if the unit does not receive a message from the logger for a given duration as set by the logger. The alarm condition goes away as soon as network communications return. The alarm mode can be disabled by the logger.

3.2.4.3.2 EL042 in independent mode

In this mode the EL042 provides three opto-isolated switches (available from the 9-way D connector 58) and an audible alarm. It can also be used with the deviation alarms in the EnviroMon software. This is the default mode of the EL042.

Alarm conditions

Audible and output alarms are controlled by messages sent from the logger. When the logger is running on internal batteries (because of external power supply and network power failure) alarms can only be maintained in their current state. They cannot be set or cleared until the network is running again.

3.2.4.3.3 EL042 specifications

Specifications for the EL042 alarm & relay unit 55

Connectors	2 x network connector 1 x output connector 1 x power connector
Indicators	1 x red LED
Enclosure	Plastic case
Output connector	DE9M See also: connector pin-out 58
Power connector	DC 1.3 mm 12 V unregulated input @ 200 mA max. Positive on centre pin
External power adaptor	12 V unregulated @ 500 mA
EL042 power supply modes	From external power supply, network or internal battery
Battery	NiCd module (as used in EL005 42)
Compliance	CE (EMC)
Environmental	0 °C to 70 °C 10% to 90% humidity not waterproof

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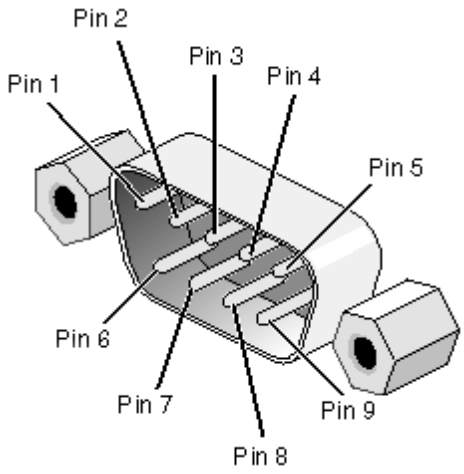
3.2.4.3.4 EL042 connector pin-out

The EL042 55's 9-way D connector provides the following outputs:

- 12 V power for speech dialler
- Alarm (or speech dialler control) signals A, B and C



Pin number	Function
1	12 V dialler output (I_{OUT} 200 mA max.)
2	Collector of opto-isolator C
3	Collector of opto-isolator B
4	Collector of opto-isolator A
5	Ground
6	N/C (do not use)
7	Emitter of opto-isolator C
8	Emitter of opto-isolator B
9	Emitter of opto-isolator A

Notes

- Collector-emitter breakdown voltage is 30 V
- Maximum continuous collector current is 150 mA
- Emitter-collector breakdown voltage is 5 V at 100 µA (only applies if incorrectly wired)

See also: EL042 example connection 59.

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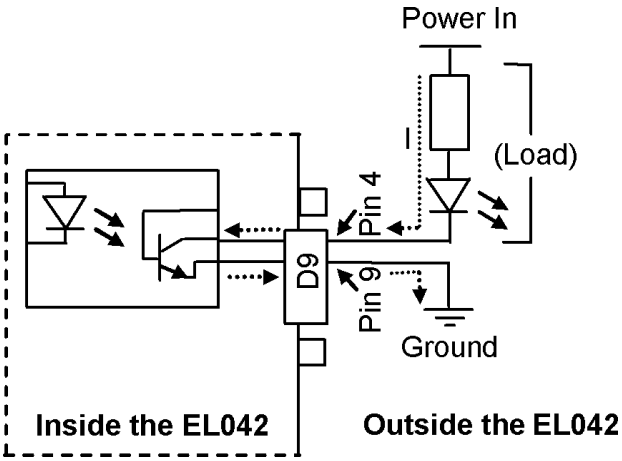
3.2.4.3.5 EL042 example connection

The following example shows how to connect the EL042 [55]'s opto-isolated Output A:



See also: EL042 connector pin-out [58].

3.2.4.3.6 Switching to EL018/EL006 emulation mode

The EL042 [55] can be reprogrammed to emulate a combination of the EL018 dialler adapter/ battery backup [53] and the EL006 remote alarm [53].

1. Connect the EL042 to the data logger and disconnect all other converters.

2. Referring to the procedure for Setting converter addresses [66], select the Change Address menu command.

3. EnviroMon will show the address of the EL042 and which mode it is in: Independent or EL018. An EL042 Independent Mode check box will then appear in the program's main window.

4. To set the EL042 to EL018 emulation mode, tick the check box, set the desired address and click Program.

Use the Change Address command again if you wish to switch the EL042 back to EL042 independent mode.

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3.2.5 Sensors

3.2.5.1 EL015 temperature sensor

A sensor is required at each location where you wish to measure temperatures.

The EL015 temperature sensor is a steel tube about 5 cm long. It has a 5 m cable and there is a sensor connector at the other end of the cable. Sensor connections >> 51. The sensor should be located where you wish to measure the temperature, for example in a refrigerator, tank or room. The connector fits into one of the three sensor sockets on a converter.

The sensor can be attached either directly to the converter, or using an extension cable up to 100 metres long. The EL020 sensor adapter provides an easy way of extending sensor cables. The standard sensor extension cable, the EL032, is 5 m long.

Standard sensor cables are not flexible at low temperatures. If it is necessary to move them, they should be warmed up before flexing.

3.2.5.2 EL030 temperature and humidity sensor

The EL030 temperature and humidity sensor is designed for use with the EL026 temperature and humidity converter. The sensor has a label on the base that shows the serial number of the sensor and also two numbers indicating the calibration information of the humidity sensor. For best results, calibrate the EL026 for a specific sensor using the calibration procedure supplied. Calibrating humidity converters>> 67

More information on the EL026 temperature and humidity converter >> 45

3.2.5.3 TA011 current clamp

The TA011 current clamp requires no power supply and can measure up to 300 A in the frequency range 50 to 60 Hz, making it an ideal sensor for monitoring mains current. It generates 1 mV for each ampere flowing through a cable.

Specifications

Sensor type	Transformer
Current input range	0.1 A to 300 A AC RMS
Accuracy	<50 A ± 3.0% >50 A ± 2.0%
Frequency response	50 to 60 Hz
Output voltage	1 mV AC per 1 A AC
Operating temperature	0 °C to 50 °C
Maximum conductor size	29 mm

Safety note

The current clamp is designed to be used on insulated wires. Using the clamp on uninsulated wires may damage the equipment and cause injury to yourself or others.

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3.2.5.4 SE0xx thermocouples

Thermocouples for use with the EL041 thermocouple converter are as follows:

SE000 Exposed Wire PTFE Thermocouple

- Chemically inert sheath
- Exposed wire junction
- Fast response time

SE001 Exposed Wire Fibreglass Thermocouple

- Tough fibreglass sheath
- Exposed wire junction
- Fast response time

Note: All of the above thermocouples are Type K.

Further information on the EL041 thermocouple converter >> 48

3.2.6 Package systems

3.2.6.1 Current monitoring kit

The current monitoring kit provides a complete solution for measuring three channels of mains current. It could typically be used for measuring and balancing three-phase supplies or monitoring the increase or decrease in current drawn from mechanical equipment to aid maintenance schedules.

Kit contents

- 1 x EL005 data logger
- 1 x EL040 monitor converter
- 3 x TA011 current clamps
- 1 x EL003 sensor cable (5 m)
- 1 x power supply
- PC software, cables and manuals

3.2.6.2 Installing a package system

Connect the current monitoring kit together as follows:

1. Logger to PC. Connect the EL005 logger to either of the 9-pin D9 serial ports on the computer using the serial cable.

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2. Power. Plug the mains adapter into a mains socket and then plug the DC connector into the logger. A red light should be illuminated on the unit to verify power has been applied.

3. Network. Connect the EL040 current monitor converter to the EL005 data logger using the EL003 network cable provided. Check that the red light on the converter is flashing to signal a successful network connection. (More information on networks 49).

4. Sensor. Attach the 4mm banana plugs from the TA011 current clamps 60 to the EL040 current monitor converter 47.

You are now ready to install the software, then configure the system. (More information on installation 65)

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3.3 Installation instructions

3.3.1 Identifying the equipment

You will need the following equipment in order to set up a simple test system:

Computer

The computer must be running Windows XP (SP2) or Vista, and must have at least one spare RS-232 or USB port. If you want to use a USB port, you will need a USB-to-RS232 adapter available from Pico Technology, order code MI069.

RS-232 port

This is a D-shaped male (with pins sticking out) connector on the back of your computer. The plug can have either 9 or 25 pins: if the plug has 25 pins, you will need an adapter. Most computers have only two serial ports called COM1 and COM2. The ports are not normally labelled, but it is usually safe to experiment to find out which is which.

As mentioned above, if your computer does not have an RS-232 port, you can use a USB port together with a Pico MI069 adapter.

Serial cable

This is a cream-coloured round cable about 2 metres long with a D-shaped 9-pin connector at each end. The male end (the one with pins sticking out) connects to the logger, and the female end attaches to the serial port on the computer.

Mains adapter

This is a black plastic block with a built-in mains plug. It has a black two-core cable that goes to a round DC connector, which plugs into the power socket on the logger.

Logger

The logger collects data and stores it until the PC is ready to receive it. It has the following connectors:

- Round DC connector to mains adapter
- D9 female connector to computer
- Two square telephone-style connectors for network

The two network connectors are joined internally, so you can use either socket, or both.

Network cable

This is a white oval cable about 5 metres long with telephone-style connectors at both ends. Note that network connectors are slightly larger than sensor connectors. Network connectors have six slots in the end, although only the middle four slots are fitted with gold contacts.

Converter

The converter changes the electrical signal from a sensor into a digital message that is transmitted to the logger. There are several types of converter, the most common being the EL001 temperature converter. The EL001 is a plastic box with two square network sockets at one end and three sensor sockets at the other end.

Each converter has a unique address between 1 and 15 that is used to identify the converter.

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Temperature sensor

The EL015 temperature sensor is a stainless steel tube, 6 mm in diameter and 50 mm long. It is fitted with a white, oval cable about five metres long, with a telephone-style connector on the other end.

The sensor connector is slightly smaller than the network connector. It has four small slots, each containing a gold contact - unlike the network connector, which has an empty slot at each end.

There is a clear plastic label on the cable next to the connector specifying the type of sensor, the batch number and the sensor number. The batch number and serial number are unique for each sensor, and can be used as a reference number for calibration information.

Now go to Connecting up the equipment 65.

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3.3.2 Connecting up the equipment

To gain experience with the system, we recommend connecting up a small system, with just a single converter, next to the computer. Once you are confident that you understand how it works, you can install the complete system in the correct place.

1. Logger to PC. Connect the logger to either of the 9-pin D9 serial ports on the computer using the serial cable, or use the serial to USB converter connected to one of the computer's USB ports. If you use the serial to USB converter, you must install its driver software on the PC before you plug it in.

2. Power. Plug the mains adapter into a mains socket and then plug the DC connector into the logger.

3. Network. Plug one end of the network cable into the logger, then plug the other end into one of the network sockets (labelled 'Net') on the converter.

4. Sensor. Plug the sensor into the first sensor socket on the converter.

Now go to installing the software 65.

3.3.3 Installing the software

1. Insert the EnviroMon CD into your CD-ROM drive
2. If auto-run is enabled, the CD will startup automatically. If so, go to step 5.
3. Click the Start button, then click My Computer
4. Double-click the icon for your CD or DVD drive containing the EnviroMon CD
5. Click the Install Software button
6. The program will guide you through the installation

3.3.4 Starting the system

To run the software:

1. Click the Start button
2. Select Programs
3. Select Pico Technology
4. Select EnviroMon

The first time you start up the software, it will offer you three choices:

1. A look at the overview section of the help file
2. A guided tour of the configuration
3. Start the configuration

If you select the guided tour, the computer will take you through the basics of setting up the system, explaining what each step involves. Alternatively, you can follow the instructions below.

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3.3.5 Setting converter addresses

Note: You can skip this section if you have only one converter; when, for example, you are using a starter kit.

If you are planning to use more than one converter, each converter must have a different address. If you have two converters with the same address, you must change the converter addresses so that each converter has a unique address BEFORE you connect up the complete network. To do this:

1. Install and run the EnviroMon software on your computer
2. Connect the logger to a serial port on the computer using the cable provided
3. Plug the power supply into the mains and connect it to the logger
4. Connect the first converter to the logger using the network cable
5. In the EnviroMon program, click the Utilities menu and then select Change Address:

6. Select the serial port (e.g. COM2) to which you connected the logger and click Next
7. Select the address that you wish to use for this converter and click Program & Continue
8. Wait until the computer reports that the converter has been programmed, and then click Finish or Program Another
9. Unplug the converter
10. Repeat this procedure for each converter

For EL026 humidity converters, see Calibrating humidity converters 67

For EL042 55 alarm/dialler adaptor units, see Emulating the EL018 59

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3.3.6 Calibrating humidity converters

If you are not using humidity converters, you can skip this section.

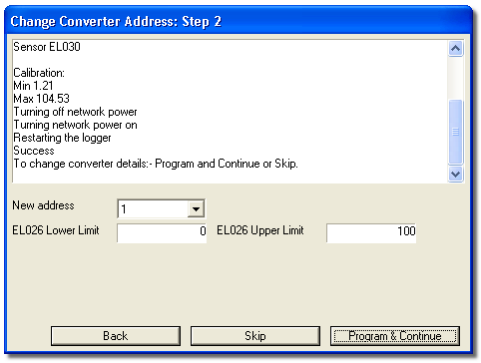
The EnviroMon humidity measuring system is made up of two parts: the EL026 converter 45 and the EL030 sensor 60. These can be connected together using a cable up to 25 metres long.

The EL030 sensor has some calibration information written on its label. Before you use an EL026 and EL030 together, you should use the Change Address command to write this calibration information into the EL026.

To do this, connect up the equipment, click the Utilities menu and select Change Address (see Setting Converter Addresses 66).

Then proceed as follows:

1. Select the serial port to which the logger is connected (e.g. COM2) and click Next. The program will then display the following dialog:



2. Select the new address that you wish to use for this converter
3. Enter the lower figure written on the label (normally about 0%) into the "EL026 Lower Limit" box
4. Enter the higher figure (normally about 100%) into the "EL026 Upper Limit" box
5. Click the Program & Continue button
6. Wait until the computer reports that the converter has been programmed
7. Unplug the converter

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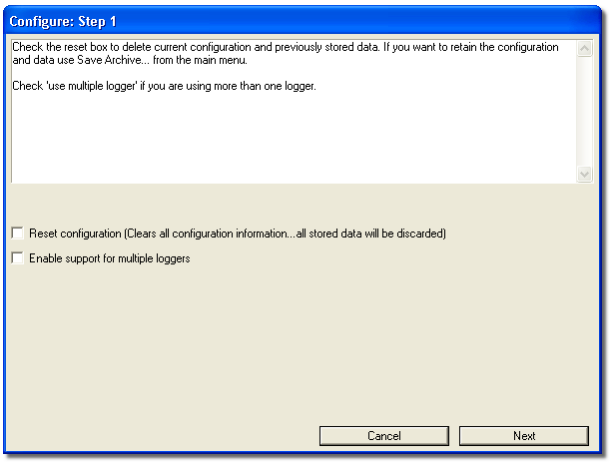
3.3.7 Configuring the system - Quick method

To start the quick configuration wizard:

1. Select Settings from the main menu
2. Select Configuration from the list
3. Select Change
3. Select Quick

You should now be in the Configure: Step 1 dialog:

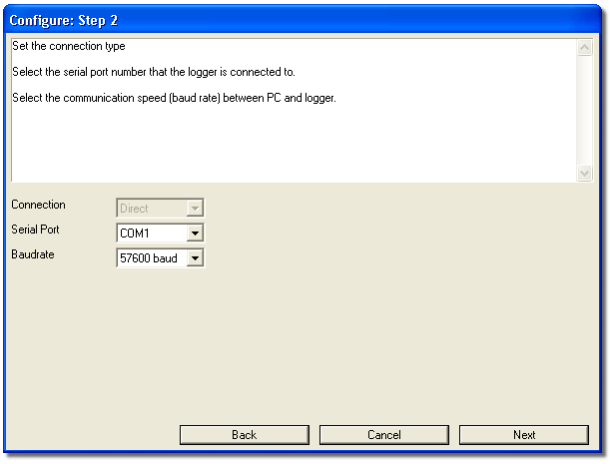

Configure: Step 1
Check the reset box to delete current configuration and previously stored data. If you want to retain the configuration and data use Save Archive... from the main menu.
Check 'use multiple logger' if you are using more than one logger.
Reset configuration (Clears all configuration information...all stored data will be discarded)
Enable support for multiple loggers
Cancel
Next

Reset: if you have already configured the system and wish to start again, tick this box.

Multiple loggers: if you have only one logger on the system, leave this box clear to simplify the configuration process.

Click Next.

This will take you to Step 2:



Connection: The type of communication port in use. EnviroMon normally selects this for you.

Serial Port: set the number of the serial port to which the logger is connected.

Baud Rate: if you do not know the baud rate of the serial port, leave this setting unchanged.

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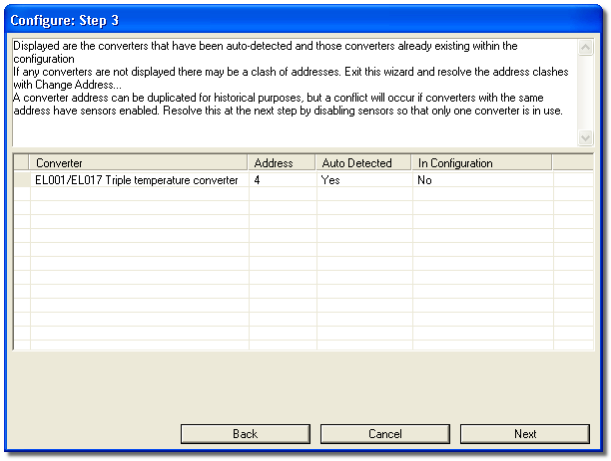
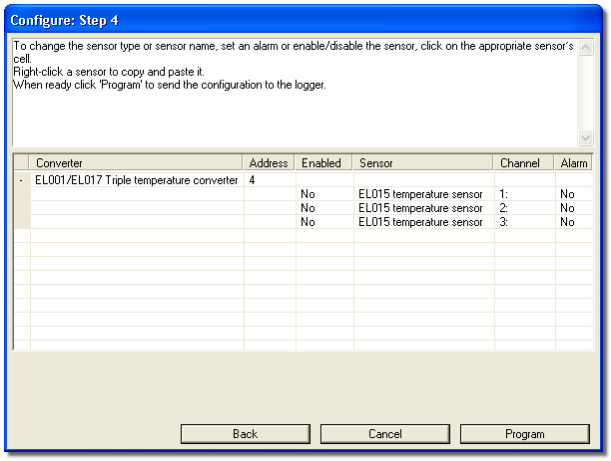
Click Next. This will take you to Step 3:


Configure: Step 3
Displayed are the converters that have been auto-detected and those converters already existing within the configuration
If any converters are not displayed there may be a clash of addresses. Exit this wizard and resolve the address clashes with Change Address...
A converter address can be duplicated for historical purposes, but a conflict will occur if converters with the same address have sensors enabled. Resolve this at the next step by disabling sensors so that only one converter is in use.
Converter
Address
Auto Detected
In Configuration
EL001/EL017 Triple temperature converter
4
Yes
No
Back
Cancel
Next

This dialog shows you all the converters that are connected to the EnviroMon network. You do not need to enter any information in this step. If any converters are missing, check that all the converter addresses are unique and, if necessary, use the Change Address 66 command to fix any problems.

When you are satisfied with the list of converters, click Next. This takes you to Step 4:



This dialog shows all the converters on the network and all the sensors attached to them.

+/-: these symbols in the left-hand column allow you to show or hide the list of sensors for each converter. This helps to simplify the display when you are setting up a large network.

Enabled: double-click a "Yes" or "No" indicator in this column to toggle the sensor on and off.

Sensor: double-click a sensor name in this column to change the sensor type.

Channel: double-click a channel number in this column to change the channel to which the sensor is attached.

Alarm: double-click a "Yes" or "No" indicator in this column to configure the alarm settings for this sensor.

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When all the sensors are set up, click Program. EnviroMon will not let you click the Program button until at least one sensor has been enabled.

3.3.8 Configuring the system - Advanced method

The advanced configuration method is necessary only for complex EnviroMon networks. We recommend that you use the quick configuration method 68 unless you have been advised otherwise.

To open the Configuration control panel:

1. Select Settings from the main menu
2. Select Configuration from the Settings menu
3. Select Change
4. Select Advanced

You should now be at the Configuration control panel. If you have already configured the system and wish to start again:

1. Click Reset
2. When the computer asks you to confirm, click Clear

Once you are back at the Configuration control panel, it is time to set the sampling rate:

1. Click General
2. Click Sampling
3. Set the Minutes per Reading field to the required value
4. Click OK
5. Click OK

Now find out what equipment is connected:

1. Click Equipment
2. Set the serial port field to the one to which the logger is connected (such as COM2)
3. Click Converters
4. Click Auto-configure
5. A box will appear and will show you the status of the auto-configure process. After a few seconds, this will disappear and the computer should display the details of your converter in the large box.
6. Click OK
7. Click OK

Now to specify where the sensors are to be located, by giving names to them:

1. Click Locations
2. Click Add
3. Type in a name for your sensor in the Name field
4. Select the channel that you wish to use (channel 1 on your converter)
5. Select the type of sensor, for example EL015.
6. Click OK

If you are planning on using the current monitoring kit, select EL040 - Amps as the sensor type.

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Now you need to program the calibration information into the logger:

1. Click Program
2. A box will appear and will show you the status of the auto-configure process. After a few seconds, this will disappear if the programming completed successfully.

The configuration is complete. You must exit the program now so that the changes will take effect:

1. Click Exit
2. Click OK

You will need to restart the software to display the readings.

3.3.9 Adding a converter

If you have a working EnviroMon system and only wish to add a converter, follow the steps below.

1. Ensure that the new converter's address is not the same as that of an existing converter on the network. You can check the existing converter addresses in the converter list in the configuration wizard 68.
2. If you need to change the converter's address, use the Change Address 66 command.
3. Attach the new converter to the network.
4. Return to the converter list and verify that the new converter is connected.
5. If necessary, amend the details of the sensors connected to the new converter.
6. When you close the configuration wizard, the computer will program the logger. You must then close and restart EnviroMon.
7. In the Monitor view 7 click the Settings menu, then select Monitor, and then Channels to open the Select parameters 18 dialog. This will allow you to add the new sensors to the monitor view.

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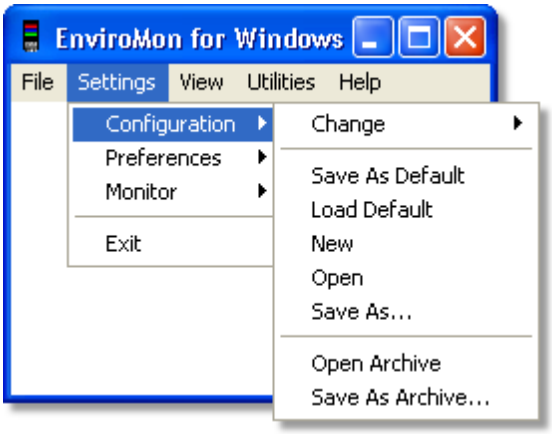
3.3.10 Saving and restoring configurations and data

The Settings menu contains commands for saving and restoring your EnviroMon configurations. You can work with either configuration (.emwcfg) files or archive (.emwarc) files.



Save As Default. Saves the current EnviroMon configuration, which you can later retrieve using Load Default.

Load Default. Loads the EnviroMon configuration that was last saved using Save As Default.

New. Clears all configuration information. If you wish to retain the present configuration, ensure that you save it before selecting this command.

Open. Opens a selected .emwcfg file containing an EnviroMon configuration.

Save As. Saves the current EnviroMon configuration in a named .emwcfg file.

Open Archive. Opens a selected .emwarc archive file.

Save As Archive. Creates an .emwarc archive file containing the EnviroMon configuration, logged data, the event log, and user scaling data.

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3.4 Special situations

3.4.1 How to use multiple loggers

If the loggers are to be connected directly to the computer, or are to be connected through a radio modem link, it is possible to access all of the loggers at the same time so that they can all be part of the same configuration. Just check the Enable support for multiple loggers box in the Configuration: Step 1 dialog 68, and the program will then detect all the loggers connected to your system.

For loggers on a telephone link, it is not possible to call all of the loggers at the same time, so it is necessary to create a separate configuration for each logger. Each configuration should use a different file path for data storage.

After configuring the first logger, save the configuration file using the Settings | Configuration | Save As Archive menu command. Use a memorable file name such as `leeds.emwcfg` (EnviroMon will supply the file extension, so you only need to type '`leeds`'). Next, create a configuration for the second logger and use the Save As Archive command again, this time using a file name of (say) `brighton.emwcfg`. You can then access the two separate configurations by selecting the Settings | Configuration | Open Archive command and choosing one of the files that you saved earlier.

See Saving and restoring configurations and data 72 for more information on the Settings | Configuration dialog.

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3.4.2 How to use a dial-up modem

The EnviroMon logger is designed for easy access through a dial-up modem. The logger connects to one modem using an EL033 modem adapter, and the computer connects directly to the other modem. The computer can then call the logger each time the EnviroMon program is run.

When you use a dial-up modem, it is necessary to set the link parameters for the logger so that it will do the following things:

- Operate at the maximum data rate supported by the modem (see below)
- Enable/disable the modem at times when it should accept calls

Most modems have an internal buffer, so it is possible to transfer data from the logger to the modem at full speed (57,600 baud) even if the modem can only send data at lower speed (for example, 14,400 baud) over the telephone link. If you set the logger to operate at 57,600 baud and it does not seem to work, try reducing the data rate to 9,600 baud.

It is also necessary to tell the PC what number to dial to establish a connection to the logger, and to specify whether to keep the link to the logger active until all data is transferred, or until the end of the EnviroMon session. If the link is kept active after the data is transferred, it is possible to monitor the current readings and to cancel alarms.

We recommend setting up the logger configuration using a direct connection, then changing to modem operation.

To change to modem operation, connect the logger to the modem port and then:

1. Go into the configuration menu (File | Configuration)
2. Select Equipment
3. Change the connection type to via telephone modem
4. Change the baud rate to 9600 baud (if required)
5. Select Telephone
6. Enter the telephone number
7. Specify whether the computer is to call the logger automatically
8. Specify any limits on the time that the logger may answer phone calls
9. Click the Set Link button on the logger dialog box
10. Disconnect power from the logger (and remove batteries if fitted)
11. Reconnect the power, and (if required) check that the logger says BAUD 9600

Troubleshooting

If you receive an error message saying "Configuration...", try adding the following options to `envimon.ini`:

```
TurnroundMs=500
MaxRetries=1
```

3.4.3 How to measure parameters other than temperature

The EL016 and EL037 voltage converters can be used to accept inputs from a wide range of sensors. For sensors that the EnviroMon system does not know about, it is necessary to specify how the voltages from the sensor are to be converted to the parameter to be measured. This process is called scaling 23.

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3.5 Advanced settings

Where to find it: Settings | Configuration | Change | Advanced

The Configuration control panel is the main interface for advanced configuration of the system. For most installations, we recommend using the quick configuration method 68.

For a first-time installation, use each of the buttons in the sequence that they appear. If you later wish to make adjustments to the system, you can go straight to the function that you wish to change, then use the Program button to write the new configuration to the logger.

Note: before you use the Program button or the Auto-configure button in the Converters dialog box (part of Loggers), the logger must be connected.

The advanced control panel buttons

General — Opens the General configuration info 76 panel. There are buttons to set the sampling interval, temperature units and other system-wide parameters.

Security — Opens the User List 84 dialog. It is necessary only if you wish to restrict access to the configuration dialogs. Its purpose is to help you define a list of people authorised to use the system.

Equipment — This button has two functions. In a system with a single data logger, it displays the Logger 86 dialog, allowing you to specify how the logger is connected to the computer. There are also buttons to enter converter information, and details about more advanced logger functions (logger printer, reporting, alarm dialler etc.) In a system with multiple data loggers, it displays the Logger list 92 dialog, allowing you to add or edit details for a number of loggers.

Locations — Displays the Sensor list 93 dialog. As well as displaying a list of the sensors currently in use, it provides options to add or edit sensors. The sensor information includes the sensor name, its address (logger, converter, channel) and its alarm limits.

Devation Alarm — Opens the Deviation Alarm 96 dialog, which allows you to set up alarms based on the differences between channels.

Program — Writes the configuration information to the logger. The process is automatic: just plug in the logger, then click the button and wait for it to complete.

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3.5.1 General configuration info panel

Where to find it: Settings | Configuration | Change | Advanced | General

The General configuration info panel allows you to control the system parameters that are not related to a specific logger or sensor.

Sampling — Opens the Sampling interval 77 dialog, which sets the time interval between recorded readings.

Temperature — Opens the Temperature display 78 dialog, which selects the units and number of decimal places for temperature measurements.

Alarm — Opens the Alarm behaviour 78 dialog, which specifies options (time ranges, repeat interval, etc.) for alarm handling.

Site — Opens the Site information 80 dialog, which accepts a site name and contact details for maintenance.

Summer time — Opens the Summer time dates 80 dialog, which sets the dates for the start and end of summer time. The logger can then automatically put its clock forward or back at the right time.

Directories — Opens the Data storage 81 dialog, which accepts directory names for data and backup files, and controls the cleaning-up of old data files.

Note: changes to the general settings are saved when you click the OK button. If you click the Cancel button, any changes are discarded.

Scale — Opens the Scale 82 dialog, which allows you to create and edit scaling files for sensors.

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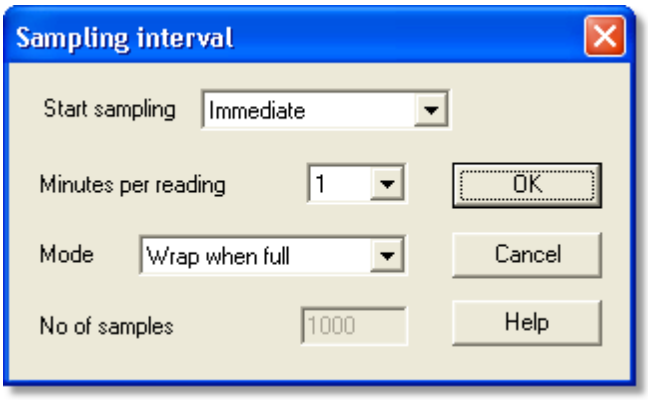
3.5.1.1 Sampling interval dialog

Where to find it: Settings | Configuration | Change | Advanced | General | Sampling

This dialog is used to specify when readings are to be recorded.



Start sampling

Leave this set to Immediate. Other options are for specialist use only.

Minutes per reading

This is time interval between recorded readings in the logger. The logger measures and displays values from sensors continuously, and then stores the average value at the intervals specified.

Mode

This defines whether to fill the whole of the logger memory with readings and, if so, whether to stop when the logger is full. There are three options, as follows:

- Wrap when full. When the logger memory is full, it starts overwriting the oldest readings. This is the correct option when you wish to collect data continuously for long periods, as the logger will then contain the most recent readings at any time.
- Stop when full. The logger stops saving readings as soon as its memory is full. This is useful if you wish to make sure that you do not lose the readings taken immediately after you start the logger, even if you do not download the information regularly.
- Stop after n samples. The same as Stop when full, but the No of samples field below defines the number of readings to collect before stopping.

Note: If you use Stop when full or Stop after n samples modes, you can restart the logger only by disconnecting and reconnecting the mains adapter and battery from the logger, or by reprogramming it.

No of samples

This specifies the number of readings to collect before stopping when in Stop after n samples mode.

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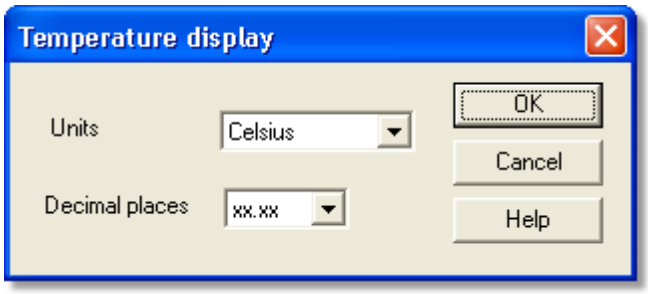
3.5.1.2 Temperature display

Where to find it: Settings | Configuration | Change | Advanced | General 76 | Temperature

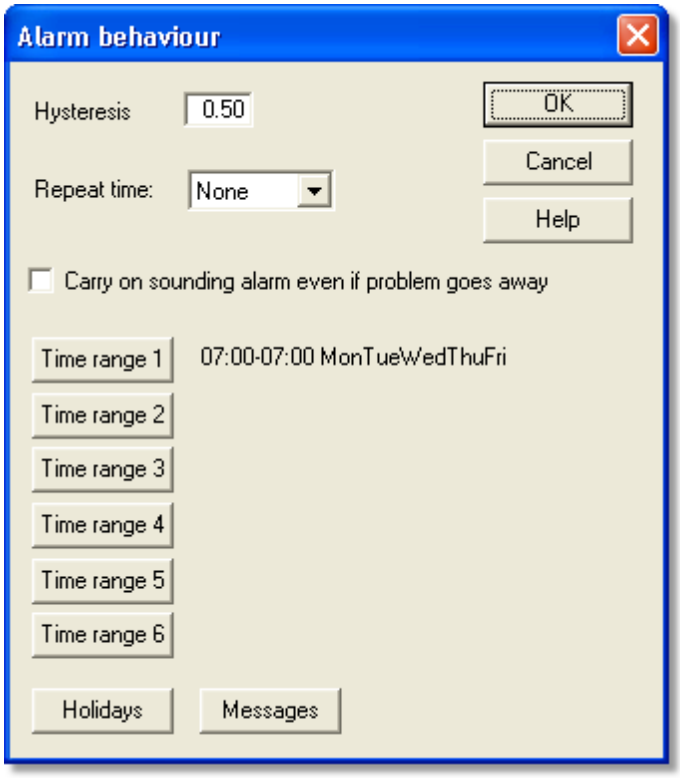
This dialog is used to specify the units for temperature measurements and the number of decimal places for measurements. Readings are normally displayed in Celsius with two decimal places, for example 4.65 °C.



3.5.1.3 Alarm behaviour

Where to find it: Settings | Configuration | Change | Advanced | General | Alarm

This dialog is used to specify the way alarms should be handled by the system.



Hysteresis

If a temperature goes out of range, it must go back in range by at least this much before the logger considers that the problem has gone away. For example, if the maximum temperature is 15 °C and the hysteresis is 0.5 °C, the temperature must drop to 14.5 °C before the problem is considered to have gone away. If the temperature drops below 15 °C but then goes above it again, this will not be treated as a new problem and the alarm will not sound again.

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Repeat time

This specifies the time interval, in minutes, that the system must wait after an alarm is acknowledged before activating the alarm again. Set to None if no repeat is required.

Carry on sounding alarm even if problem goes away...

If this option is enabled, the alarm will carry on sounding even after the problem goes away. This is useful if the logger is to be left unattended for long periods and you need to know about problems that occurred while the logger was left unattended.

Time range 1..6

Each of these six buttons opens the Alarm time range dialog box, which is used to specify a time range during which alarms are to be active - for example, 09:00-17:00 Monday to Friday. There are six time ranges, and a sensor can be associated with any combination of ranges. If you are using an EL042 alarm & relay unit, this dialog also allows you to specify which EL042 outputs are active. (More on sensor alarms) 95

Once the details have been specified for a time range, the details will be displayed next to the relevant button.

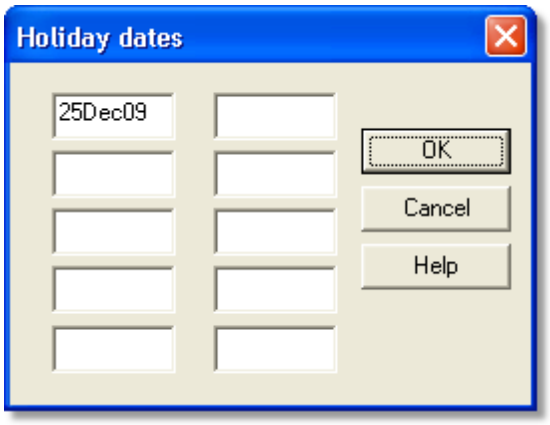
Holidays

This button opens the Holiday dates 79 dialog box, which can be used to specify the dates of up to 12 holidays. Alarm time ranges can be disabled on the specified holidays if required.

3.5.1.4 Holiday dates

Where to find it: Settings | Configuration | Change | Advanced | General | Alarm | Holidays

This dialog box is used to specify a list of dates of up to twelve holidays. It is then possible to disable some or all alarm time ranges on the specified holidays. This could be used to disable sensors in processing (rather than storage) areas on days when a processing plant is shut down for a holiday.



The dates must be entered in the format DDMmmYY, for example 25Dec09. It is not necessary to enter any details if you do not need to make special arrangements for holidays.

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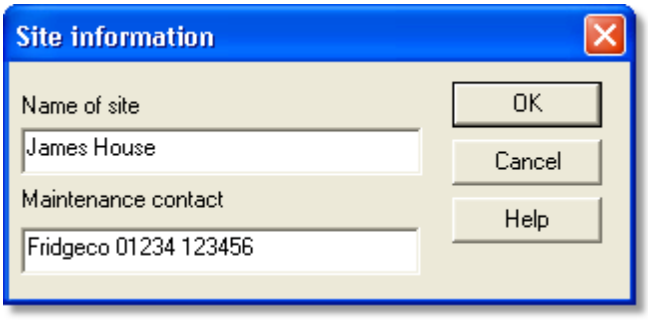
3.5.1.5 Site information

Where to find it: Settings | Configuration | Change | Advanced | General | Site

This dialog is used to specify the site name and maintenance contact. This information appears on reports printed by the computer or by the logger.



Name of site. The name of the site where the loggers are to be installed.

Maintenance contact. Contact details for maintenance calls. For example, in a freezer monitoring application, this might be the the name and telephone number of the refrigeration engineer.

3.5.1.6 Summer time dates

Where to find it: Settings | Configuration | Change | Advanced | General | Summer time

In countries that are a long way from the equator, it is normal to adjust the clocks by one hour at the start and end of summer. This has different names in different countries: for example, daylight saving time, or British Summer Time.

You can enter the start and end times for summer time for the next few years, and then the logger will automatically adjust its clock on the specified days.

Note: in the Northern hemisphere, the start and end times will be in pairs, each pair for the same year. In the Southern hemisphere, the start of summer will be in October of one year and the end of summer will be in March of the following year.

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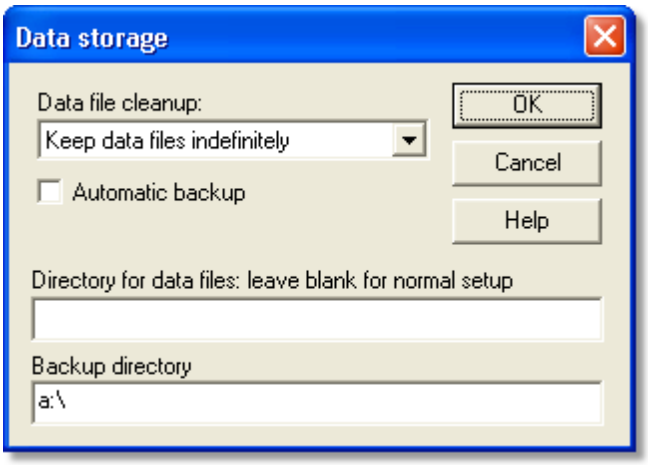
3.5.1.7 Data storage

Where to find it: Settings | Configuration | Change | Advanced | General | Directories

This dialog is used to set the directory names for data files and backup.



Data file cleanup. This option can be used to clean up old data files when they are no longer required. The options are:

- Keep data files indefinitely
- Delete after one month
- Delete after three months
- Delete after a year

Automatic backup. If this option is checked, the program automatically does a backup when you exit from the program. This is probably more suitable for backup to a network drive than for backup to a diskette. If this option is not checked, you can still do backups using the Backup option on the File menu.

Directory for data files: leave blank for normal setup. This is a handy feature if you want to save the file containing the data somewhere different (for example, on a network drive so that it can be backed up more easily) or if you wish to operate several loggers independently, each with their own data files. For most applications, it can be left blank, and the file containing the data will be stored in the same directory as the EnviroMon program. To specify that data files should be stored on network drive G: in a directory called Pico, type in G:.

Backup directory. This is where files will be copied when a backup takes place. This could be either a diskette drive or a network directory. If you specify a diskette drive, the computer asks you to insert a blank, formatted diskette before each backup.

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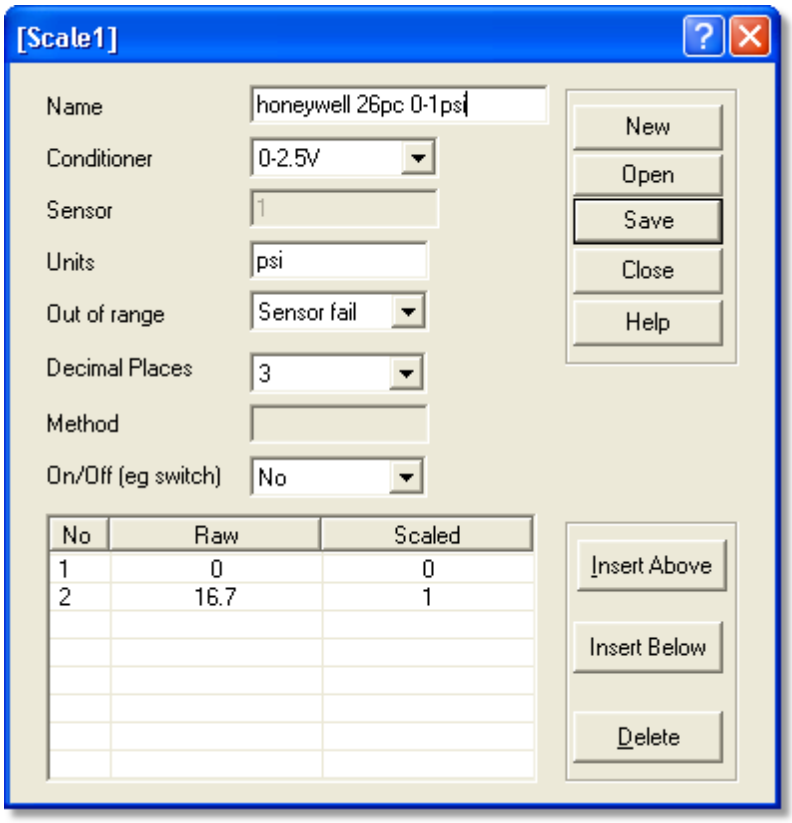
3.5.1.8 Scale

Where to find it: Settings | Configuration | Change | Advanced | General | Scale

The Scale dialog is the easiest method for creating scaling look-up tables. (Overview of scaling tables) 23



Name. The name of the scaling method. The same scaling method could be used for multiple sensors (in this case, for example, the pressure from a number of different sensors of this type).

Conditioner. The type of conditioner that the sensor will work with. If this sensor does not require a signal conditioner, set the conditioner type to 'None'.

Sensor. A unique reference for this scaling method. EnviroMon fills in this field for you.

Units. The units appear next to the parameter value on graphs, reports etc.

OutOfRange. Specifies what to do if the raw value is outside the range of the table lookup. The options are:

- treat as a sensor failure
- clip the value to the minimum or maximum table value
- extrapolate the value using the nearest two table entries

Places. The number of decimal places. With 1 decimal place, the value 15 would be displayed as 15.0. With 2 decimal places, same number would appear as 15.00.

Method. The scaling method. This is always 0 (table lookup method).

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On/Off. For numeric parameters, set to 'Off'. For parameters that can have only two values (on or off), set to 'On'. Then set the scaling table so that Raw=0 corresponds to Scaled=0, and Raw=1 corresponds to Scaled=100. The logger will then display 'On' or 'Off' for the parameter, and reports will show the percentage of time that the parameter was 'On'.

No, Raw, Scaled. Column headings for the look-up table.

- No is the row number, supplied automatically by EnviroMon.
- Raw is the raw value from the sensor, normally in millivolts, but for the CM007 (4-20mA) conditioner, it is in milliamperes.
- Scaled is the scaled value corresponding to each raw value. It is in the units specified by the Units parameter.

New. Clears all data in the table, ready for you to enter a new set of data.

Open. Shows a list of all scaling tables that you have previously stored. If you select one of these, it will be copied into the Scale dialog for you to examine or edit.

Save. Saves the present scaling data using the name in the Name box. Remember to change this name if you wish to create a new scaling table; otherwise you will overwrite the table that was previously opened.

Close. Close the dialog without saving the scale data.

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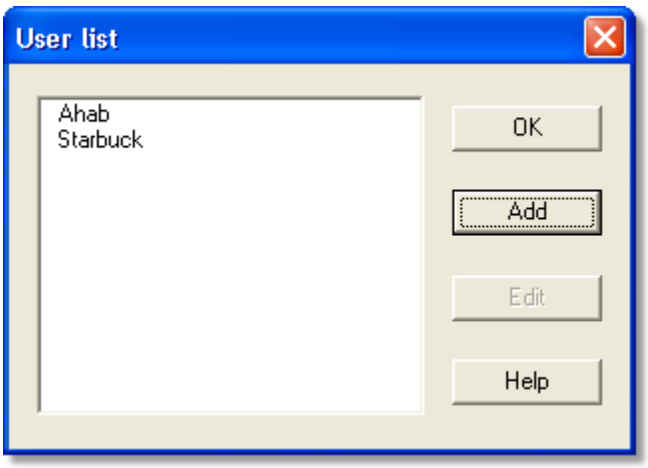
3.5.2 User list dialog

Where to find it: Settings | Configuration | Change | Advanced | Security

This dialog shows details for each of the users who are, or have been, authorised to use the system. An 'x' next to the name indicates that they are no longer active. You can add new users or edit the details of existing users. It is not usually necessary to specify users if only one person will be using the system. If you do add any users, the computer will ask for a password if you attempt to use the Settings | Configuration | Change command.



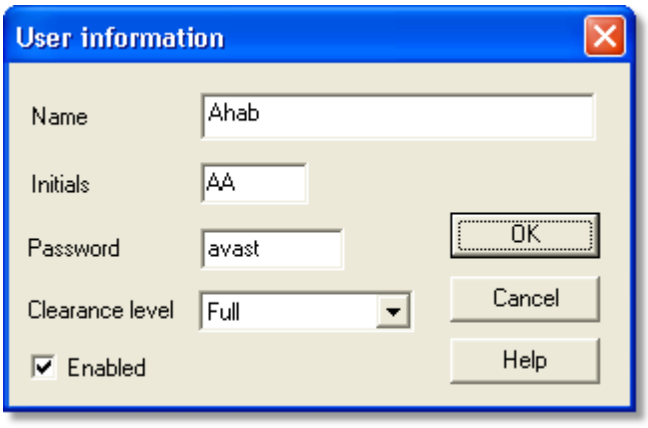
Add. Click to add a new user.

Edit. Click one of the names in the user list. When the name is highlighted, clicking the Edit button will enable you to edit the details for the selected user.

3.5.2.1 User information

Where to find it: Settings | Configuration | Change | Advanced | Security | Add

This dialog is used to enter the details for a new or existing user. This process is optional. After you have created and enabled the first user, EnviroMon will require you to log in before you can make any further configuration changes.



Name. The user's full name.

Initials. The user's initials.

Password. The computer will ask for this each time somebody enters a secure part of the program.

Clearance level. This controls what the user can do. The options are:

- None. The user has no access.

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- Check. The user is able to check the current temperatures.
- Note. The user is able to edit details of events.
- Full. The user has access to all parts of the system, including configuration.

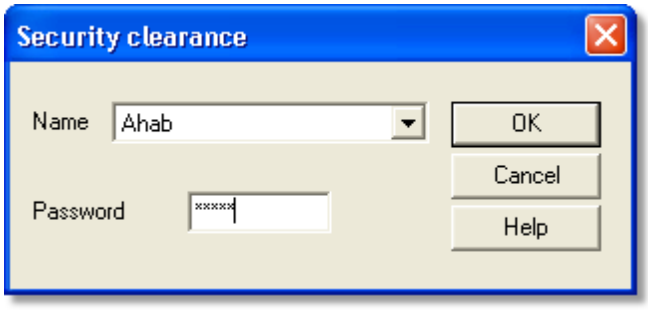
Note: when you add the first user, always set the Clearance level to Full, otherwise you will not be able to get back into the configuration to change it.

Enabled. It is not possible to remove details of old users, as the system may need to refer to their data at some point in the future. Instead, uncheck the Enabled box to remove the person from the list of active users. If you disable all users, then EnviroMon will let you reconfigure the system without logging in.

3.5.2.2 Password dialog

Where to find it: Settings | Configuration | Change

This dialog enables you to log in to EnviroMon. It appears when you try to open the Configuration panel 75 from the Settings menu and there is at least one active user in the User list 84.



User. This is a list of active users. Select your name from the list.

Password. Enter your password here. It will be displayed as asterisks as you type.

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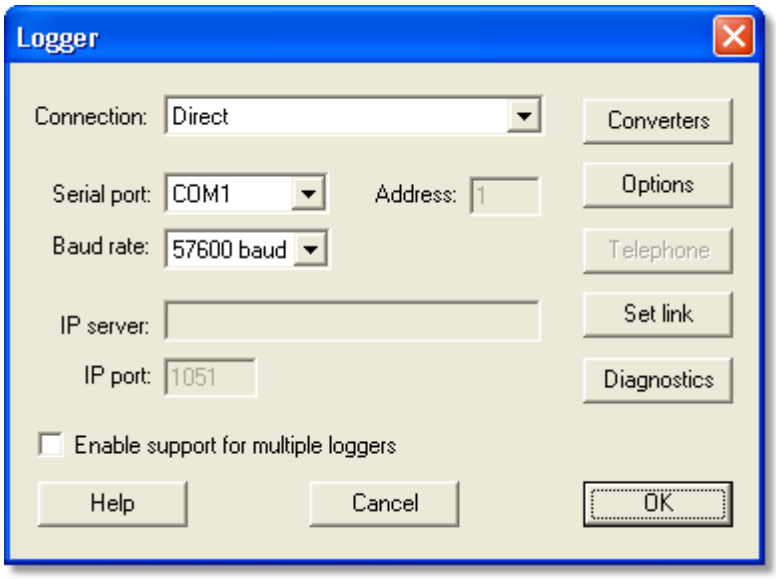
3.5.3 Logger dialog

Where to find it: Settings | Configuration | Change | Advanced | Equipment

This dialog enables you to specify how the logger is connected to the computer. There are also buttons that give access to other dialog boxes for entering converter details and controlling advanced logger functions (printing, etc.)



Connection. Specifies how the logger is connected. The options are:

- Direct. The logger is connected directly to the serial port on the computer. You can connect up to nine loggers to the same computer in this way, each to a separate serial port.
- Via telephone + modem. The logger is at a remote site, and the computer uses a modem to make a telephone call to the logger each time you request information. Use the Telephone button to enter details of the link. It is only possible to connect one logger by telephone. If you need to access more, you should create a separate configuration for each logger.
- Via radio modem. The computer is connected to a radio modem, as is the logger. Up to 250 loggers may be connected, each with a separate address.

Note: Loggers are supplied programmed for direct connection at 9600 baud. If you change the baud rate option or you wish to use a telephone modem, you should use the Set Link option (see below) to write the link parameters into the logger.

Serial port. Selects which COM port is to be used.

Address. Used on a multi-logger radio link. Each logger has a unique address between 1 and 255. All loggers receive all messages from the computer, but only respond to messages containing their address.

Baud rate. Specifies the data rate to use for the link to the logger. For a direct link over a short cable, use 57600 baud. For a modem, check the maximum speed that the modem can handle. Most modern telephone modems can operate at 57600 baud to the logger, even if they operate at a lower speed over the telephone link.

Enable support for multiple loggers. If you check this box, the computer replaces this dialog box with the Logger list 92 dialog, with which you can add, edit or remove the details for loggers.

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Most systems require only a single logger, so the computer normally only presents a dialog box for a single logger. Even if you wish to use multiple loggers, it may be more practical to set up a separate configuration for each logger. That way, the data for each logger is kept separate. This option is only useful if you wish to combine the data from multiple loggers.

Converters. Opens the Converter list 87 dialog box which provides a list of all the converters attached to the logger.

Options. Opens the Logger Options 89 dialog box which controls optional equipment that can be connected directly to the logger.

Telephone. Opens the Logger dialup options 90 dialog box which enables you to specify how the dial-up link to the logger is to operate.

Set link. Programs the connection settings into the logger. Loggers are supplied ready-configured for direct connection to the computer, so you do not need to use this option for loggers intended for direct connection. You use this button only when you have changed the connection mode. Connect the logger directly to the port that you have specified, then click the button and wait for it to complete. The programming is automatic.

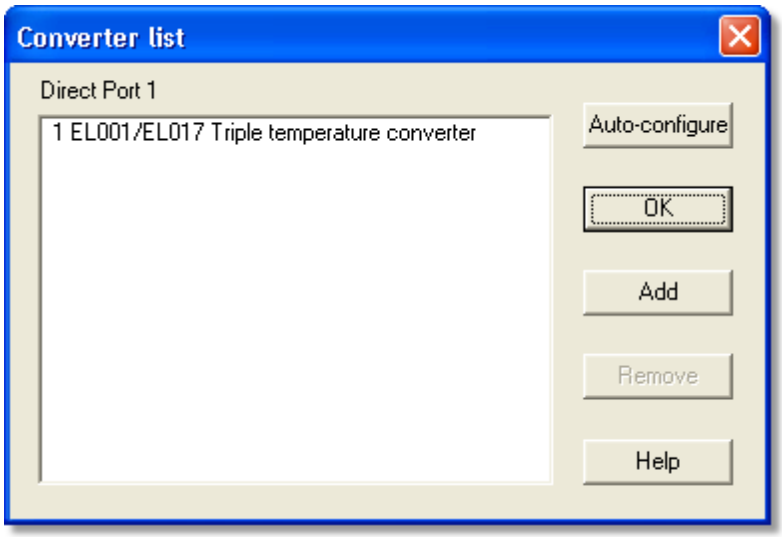
Note: The logger must be powered down and restarted to activate the new link parameters.

Diagnostics. Opens the Network diagnostics 91 dialog. Do not use this option unless directed to do so by Pico Technical Support staff.

3.5.3.1 Converter list

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Converters

This dialog shows a list of converters connected to the selected logger. There are also controls to add or remove converters, or to automatically detect the converters connected to the logger.



The converter list shows the address and type of each of the converters attached to the logger. Each converter must have a different address. You can use the Change Address 66 command to alter the address of a converter.

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It is not necessary to add devices that do not have sensors (for example, the EL006 remote alarm), but the auto-configure function will add them to the list as a check that they are linked correctly to the logger.

If you auto-configure, the computer also displays any alarm devices connected to the network (for example, the EL016, the EL018 53, or the EL042).

Note: Each EL016 requires three addresses, so it appears three times in the list. See also: EL016 voltage converter 45.

Auto-configure. Automatically update the list of converters connected to the logger. Note: the logger must be connected before you select this option.

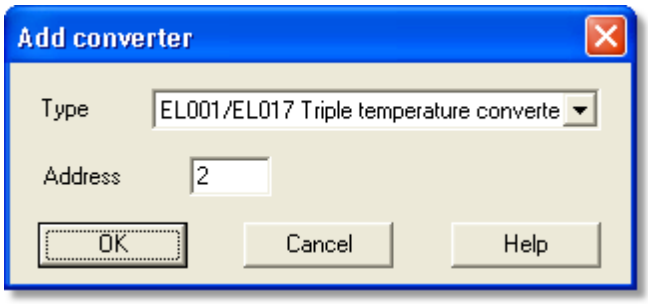
Add. Add a new converter to the logger. This will open up the Add converter 88 dialog.

Remove. To remove one of the converters listed, highlight it and then click this button.

3.5.3.2 Add converter

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Converters | Add

This dialog is used to enter the details for a new converter.



Type. The converter type.

Address. Each converter connected to the logger must have a different address. If you have two converters with the same address, you should use the Change Address 66 command to change the address of one of the converters.

If you make a mistake and enter the same converter twice, the computer will warn you when you try to program the logger.

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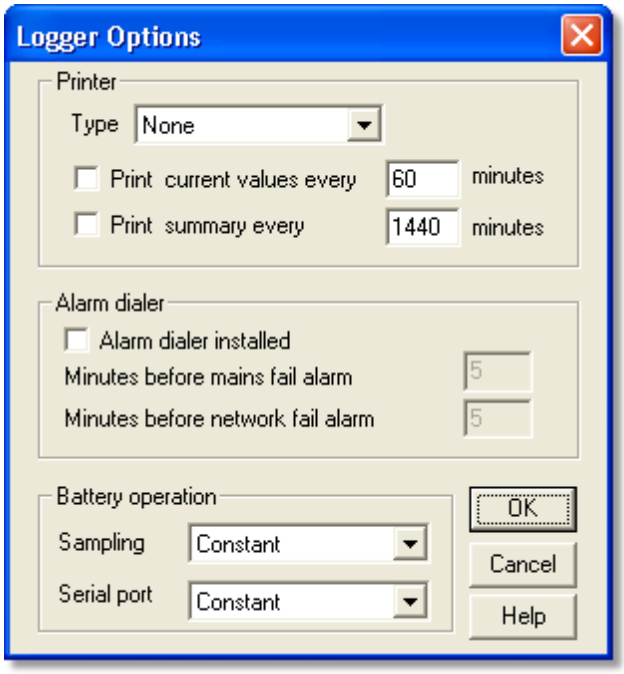
3.5.3.3 Logger options

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Options

This dialog contains controls for optional equipment connected to the logger.



Alarm dialler. The logger can be connected to a dialler unit so that, when an alarm occurs, the dialler calls a specified number and delivers a recorded message. The dialler connects to the logger using an EL018 or EL042 dialler interface. In addition to providing a link to the dialler, the EL018 and EL042 provide the following functions:

- A larger backup battery, with mains charger
- Detection of mains failure
- Detection of network failure (the logger is no longer in contact with the EL018 or EL042)

On detection of mains or network failure, the interface can be programmed to activate the alarm dialler after a specified period of time. (Additional information on the EL018 53 and EL042) 55

Battery operation. With the EL005 logger, it is possible to specify what functions are to carry on if the mains power fails, in order to conserve battery power.

The sampling can be set as follows:

- Constant. All the time, even during mains fail.
- Reduced. At a reduced rate (only one reading for every sample interval).
- Stopped. Stop taking readings.

The serial port can be set as follows:

- Constant
- Only if DTR
- Off

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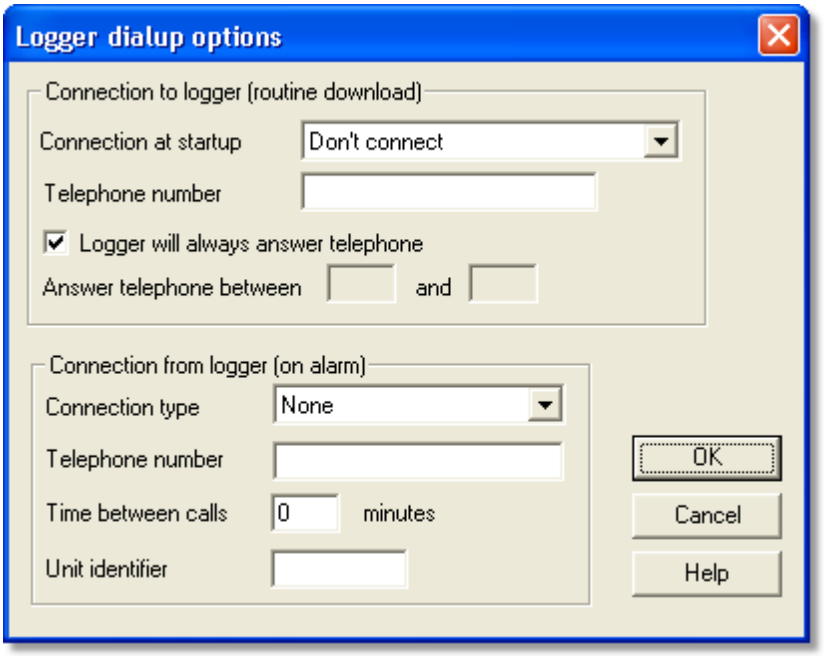
3.5.3.4 Logger dial-up options

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Telephone

This dialog enables you to specify the details of:

1 Connection to logger (routine download)
2 Connection from logger (on alarm)

Note: The Telephone button is greyed out unless the connection type you have selected in the Connection: part of the Logger dialog is via telephone + modem.



1. Connection to logger (routine download) section of dialog

Connection at startup. Specifies whether the computer should start a connection to the logger each time EnviroMon starts up. The options are:

- Don't connect. The logger is connected directly to the serial port on the computer. You can connect up to nine loggers to the same computer in this way, each to a separate serial port.
- Disconnect after data transfer. The computer dials the logger at start-up, but releases the link as soon as all of the new data has been transferred from the logger.
- Remain connected. The computer is connected to a radio modem, as is the logger. Up to 250 loggers may be connected, each with a unique address. You can manually connect or disconnect at any time. This option simply controls the automatic connection at start-up.

Telephone number. The telephone number that the computer should use to establish a link to the logger.

Logger will always answer telephone. If you check this box, the logger will keep its modem permanently enabled so that it will always answer an incoming call. This is all right if the logger modem is on a separate phone line.

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If you leave this box unchecked, you can specify a time range during which the modem will answer calls. This means that the modem can be connected to a phone line which is used for voice calls during the day, but which is enabled for modem access to the logger outside working hours.

Answer telephone between. The time range during which the modem is to be enabled. Note that Logger will always answer phone should be left unchecked.

2. Connection from logger (on alarm) section

This section of the dialog box is only available for the EL005 logger. (More information on the EL005 logger 42)

Connection type. Specifies what type of connection the logger is to establish when an alarm occurs. The options are:

- None. No message of any type.
- GSM SMS message. Delivers a text message via a mobile phone (requires Siemens M20 GSM modem).
- Pager message. Delivers a numeric message (the unit identifier) to a pager.

Telephone number. The number to call on alarm, for example the telephone number of the GSM phone to deliver an SMS message to.

Time between calls. If the alarm remains active, this option specifies the time, in minutes, between successive alarm calls.

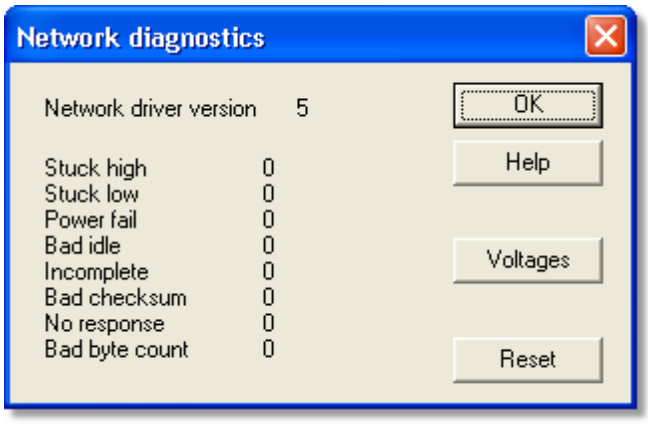
Note: If you do not set this field, you will get a call every sample interval!

Unit identifier. If there are several loggers that could raise an alarm, this field can be used to identify which logger is sending the alarm message. It must be a maximum of 8 characters. For pagers, the characters must all be digits.

3.5.3.5 Network diagnostics

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Diagnostics

This dialog shows the network driver version and a summary of errors detected on the network. Use this option only if directed by Pico technical support staff to do so.



The Voltages button opens the Voltages dialog that shows internal voltages within the logger (EL005 only).

The Reset button clears the error counts to zero.

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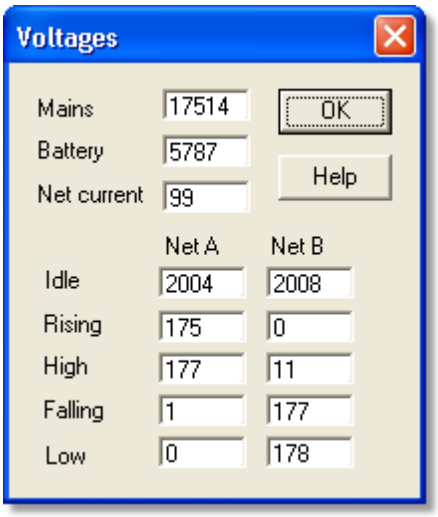
3.5.3.6 Voltages

Where to find it: Settings | Configuration | Change | Advanced | Equipment | Diagnostics | Voltages

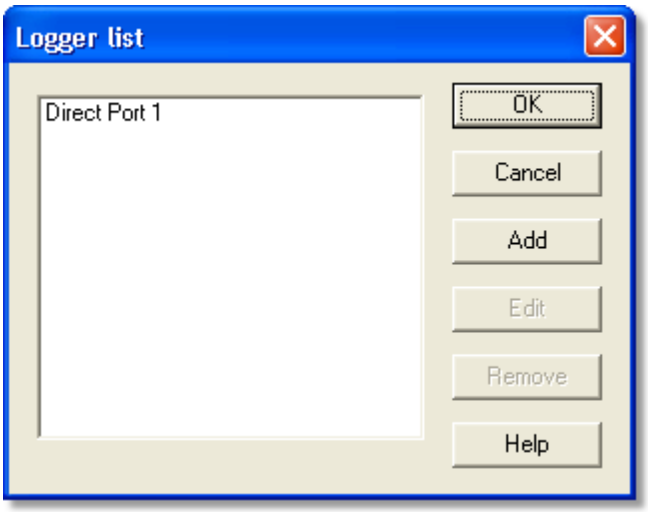
This dialog displays a number of voltages within the logger. Use this button only if directed by Pico technical support staff to do so.



3.5.3.7 Logger list

Where to find it: Settings | Configuration | Change | Advanced | Equipment

This dialog appears only when you tick the check box against Enable support for multiple loggers on the Logger dialog. In the left pane is a list of loggers. The buttons on the right enable you to add, edit or remove loggers using multiple Logger dialog boxes.



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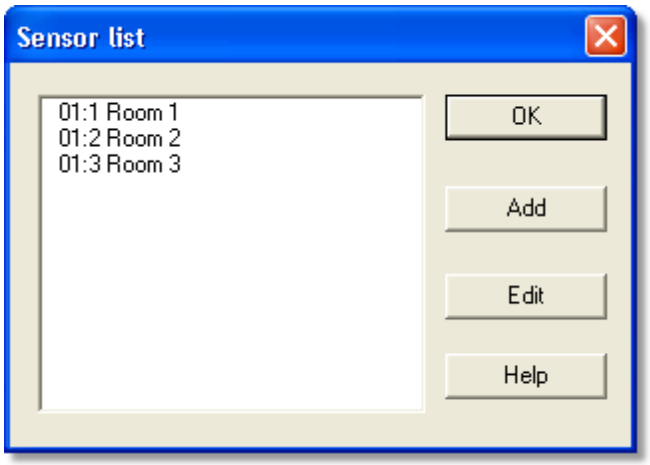
3.5.4 Sensor list dialog

Where to find it: Settings | Configuration | Change | Advanced | Locations

This dialog shows a list of the sensors connected to all loggers and converters in the system. There are also controls to add or edit the details for sensors.



The list has a line for each sensor. It shows the address of the sensor (logger, converter and channel) and the sensor name. If the sensor is disabled, an 'x' is displayed before the address.

Add. Add a new sensor to the list. The Sensor information 94 dialog appears.

Edit. To edit the details of an existing sensor, click the sensor whose details you wish to change, so that it is highlighted. Then click Edit, and the computer will open a Sensor information dialog box.

It is not possible to remove details of previous sensors, as the system may need to refer to their data at some point in the future. Instead, uncheck the Enabled box on the Sensor information dialog for a particular sensor. This will remove the sensor from the list of active sensors.

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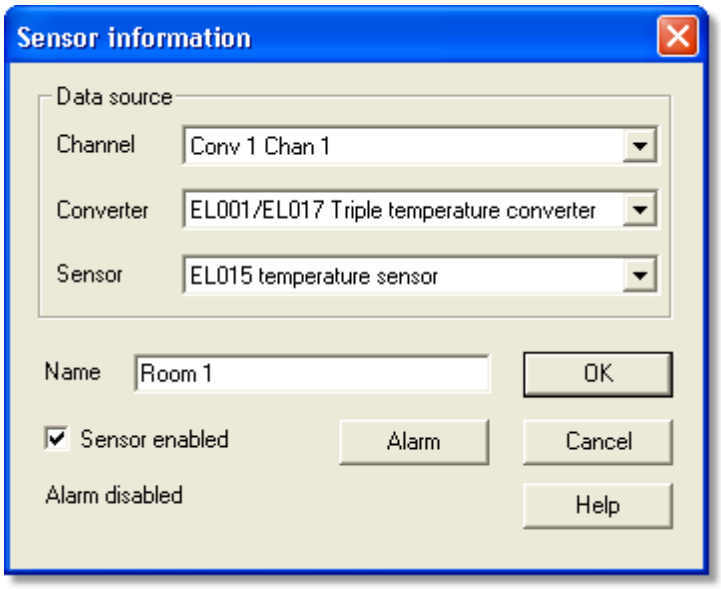
3.5.4.1 Sensor information dialog

Where to find it: Settings | Configuration | Change | Advanced | Locations | Add
Settings | Configuration | Change | Advanced | Locations | Edit

This dialog is used to add or edit the details for a sensor.



Channel. Specifies the converter and channel for the sensor. It contains a list of all the current combinations of loggers, converters and channels.

Note: The EL016 45 appears as three 3-channel converters. The first corresponds to channels 1 to 3, the second corresponds to channels 4 to 6 and the third is channels 7 and 8 (there is no ninth channel).

The logger can measure a number of internal parameters 43.

Converter. The type of converter that the selected channel belongs to. You cannot change this option.

Sensor. Selects the type of sensor. You should select the channel and conditioner before specifying the sensor type.

Name. This can be any text that you wish to use to describe the sensor. It can be up to 32 characters, but only 16 characters will appear on the display of the logger.

Sensor enabled. Ticking the check box specifies that the sensor is enabled.

Alarm disabled message. Depends on the settings in the Sensor alarm 95 dialog box.

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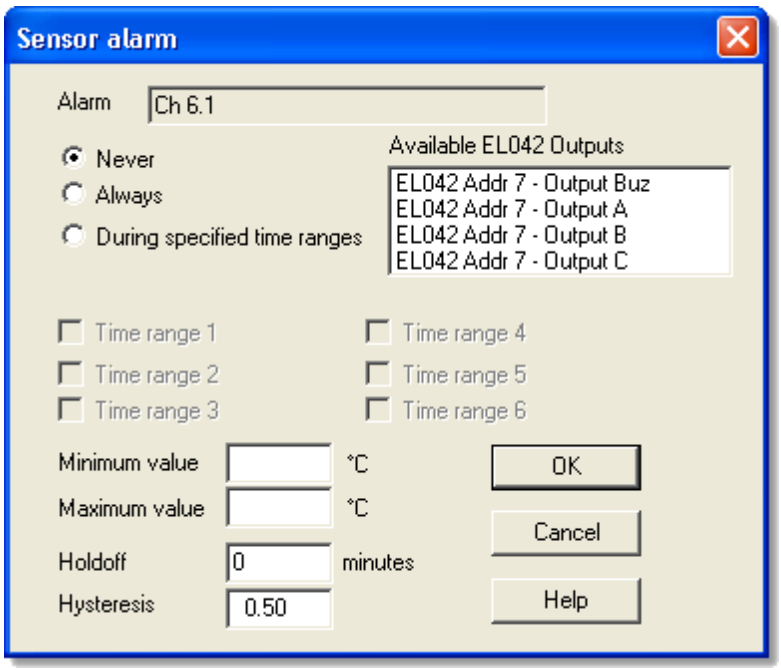
3.5.4.2 Sensor alarm

Where to find it: Settings | Configuration | Change | Advanced | Locations | Add | Alarm
Settings | Configuration | Change | Advanced | Locations | Edit | Alarm

This dialog box is used to specify the details for one of the three alarm time ranges. The alarm for a sensor can be enabled during any combination of these time ranges.

Note: It is not necessary to enter any details if you want to have alarms for all sensors either permanently active or permanently disabled.



When the alarm is enabled for this sensor, the alarm will sound when the value goes out of range or if the sensor or converter fails. There are several options:

- Never. The alarm is never enabled for this sensor
- Always. The alarm is always enabled
- During specified time ranges
  Time range 1 - the alarm is enabled only during alarm time range 1
  Time ranges 1 & 2 - the alarm is enabled only during alarm time ranges 1 and 2
  Other combinations - for example, 1 and 3
- Available EL042 outputs. This list appears only if an EL042 is connected to the network. It allows you to select which EL042 output or outputs should be activated on an alarm condition.

See the Alarm behaviour 78 dialog for more details of alarm time ranges.

Minimum value. The minimum value for the acceptable range of the sensor. Leave this field blank if you do not wish to set a lower value for this sensor.

Maximum value. The maximum value for the acceptable range of the sensor. Leave this field blank if you do not wish to set an upper value for this sensor.

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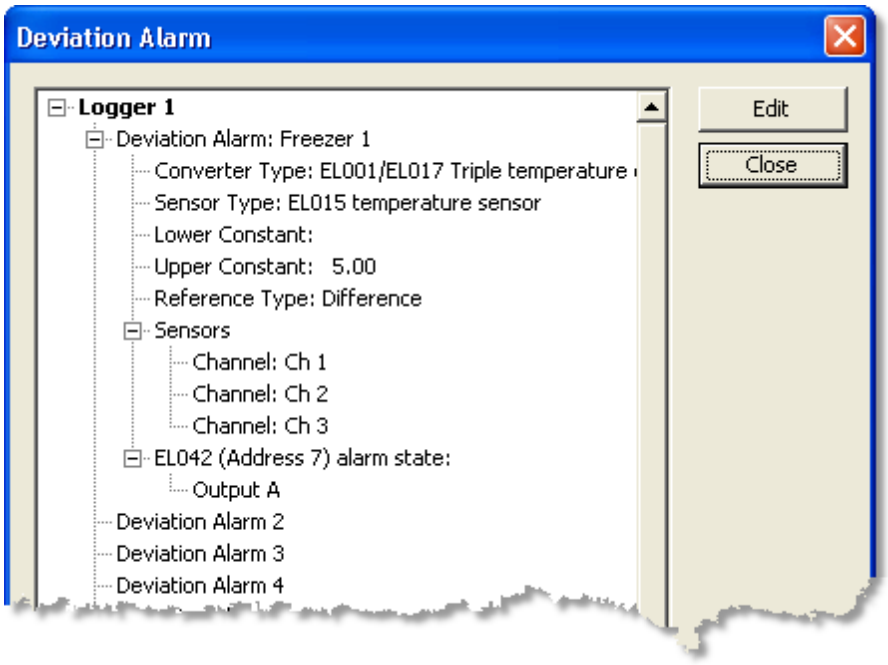
Holdoff. The period, in minutes, between the value going out of range and the alarm sounding. This is useful if the value occasionally goes out of range for short periods, as with the temperature of a freezer during a defrost cycle. The holdoff should be set to the minimum time interval required to prevent spurious alarms. It should be set to zero if an immediate alarm is required. Otherwise, it should be at least four times the sampling interval, so with a sample time of 5 minutes it should be at least 20 minutes.

Hysteresis. If a temperature goes out of range, it must go back in range by at least this much before the logger considers that the problem has gone away. For example, if the maximum temperature is 15 °C and the hysteresis is 0.5 °C, the temperature must drop to 14.5 °C before the problem is considered to be over. If the temperature drops below 15 °C but then goes above it again, this will not be treated as a new problem, and so the alarm will not sound again.

3.5.5 Deviation Alarm dialog

Where to find it: Settings | Configuration | Change | Advanced | Deviation Alarm

This dialog gives you an overview of the deviation alarms in place, and allows you to edit or remove them. (What is a deviation alarm?)



Edit. Clicking this button, or double-clicking a deviation alarm in the list, takes you to the Deviation Alarm Setup 97 dialog. This allows you to edit the settings of the deviation alarm or to remove it entirely (use the Clear button in that dialog).

Close. Closes the dialog, preserving any edits that you have made.

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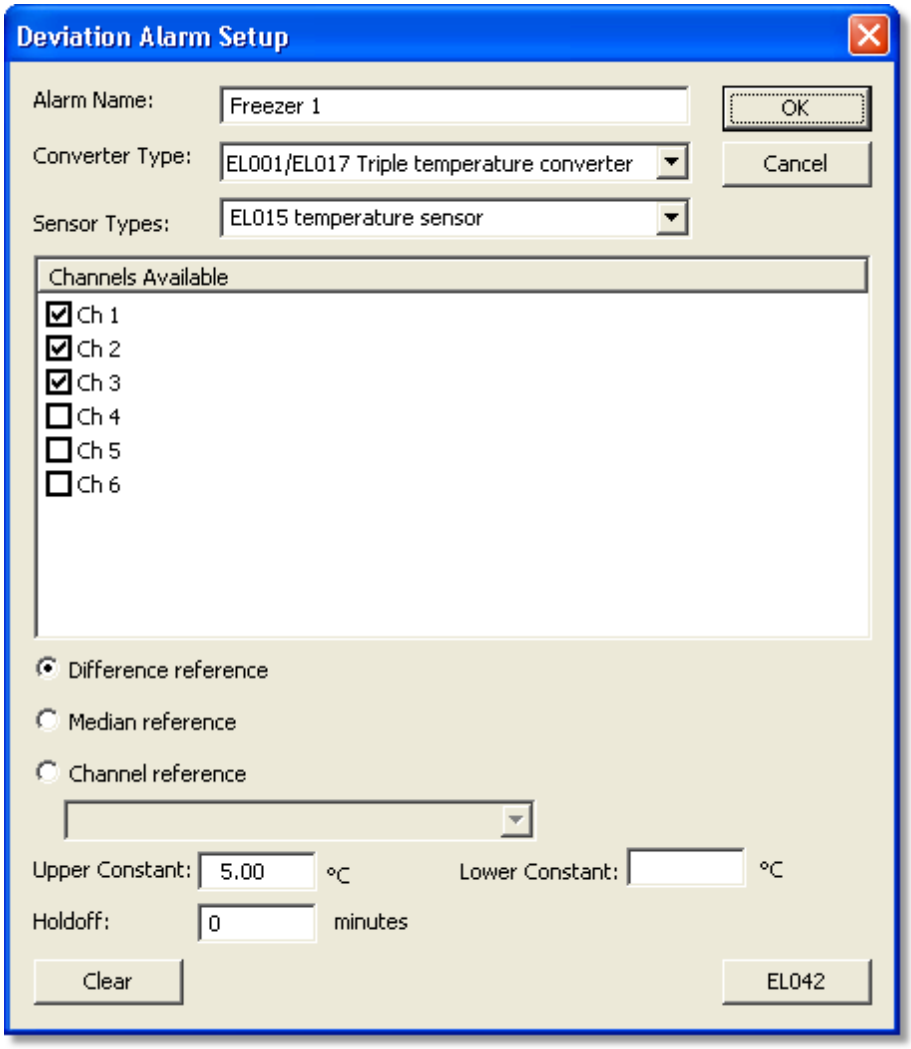
3.5.5.1 Deviation Alarm Setup dialog

Where to find it: Settings | Configuration | Change | Advanced | Deviation Alarm | Edit

This dialog lets you create and edit deviation alarms.



Alarm name. Type any name here to help you identify the deviation alarm. This name will appear in the Monitor view 8.

Converter Type. All the channels monitored by a deviation alarm must belong to converters of the same type. Select the converter type here.

Sensor Types. Once you have selected a converter type, this list will contain all the possible sensor types for that converter. Select the sensor type you wish to use for this deviation alarm.

Channels Available. This is a list of all available channels that match the selected converter type and sensor type. Each channel can be used in only one deviation alarm, so channels that are already in use in other deviation alarms will not appear here. Tick the box next to each channel that you wish to include in this deviation alarm.

Difference reference / Median reference / Channel reference. Select one of these types of deviation alarm. They function as follows:

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Difference reference. The deviation alarm is set if the difference between the highest and lowest readings from the selected channels exceeds the value you type in the Delta edit box.

Median reference. The deviation alarm is set if the reading from any channel exceeds the median of all the channel readings by more than Upper Constant, or falls below the median of all the channel readings by more than Lower Constant.

Channel reference. The deviation alarm is set if the reading from any channel exceeds the reference channel reading by more than Upper Constant, or falls below the reference channel reading by more than Lower Constant. Select the reference channel from the drop-down list.

Holdoff. The deviation alarm will not be set if the deviation condition exists for less than the holdoff time that you type here.

Clear. Click to clear all values in the dialog box and disable the deviation alarm.

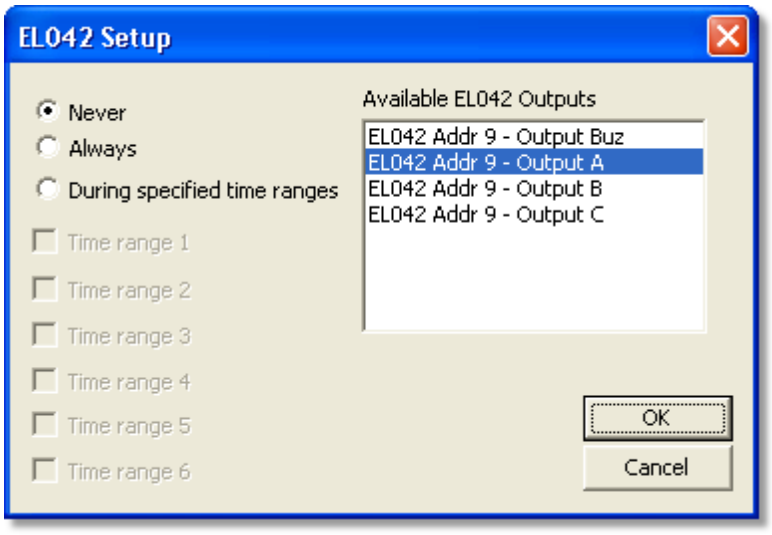
EL042. Click to open the EL042 Setup 98 dialog. You MUST enable at least one EL042 output from the EL042 Setup 98 dialog before clicking OK in the Deviation Alarm Setup dialog, otherwise you will receive an error message.

OK. Click when all values in the dialog are correct and you wish to enable the deviation alarm. EnviroMon will not allow you to close the dialog using this button unless you have enabled at least one EL042 output in the EL042 Setup 98 dialog.

3.5.5.2 EL042 Setup dialog

Where to find it: Settings | Configuration | Change | Advanced | Deviation Alarm | Add | EL042
Settings | Configuration | Change | Advanced | Deviation Alarm | Edit | EL042

This dialog allows you to specify which EL042 outputs should be activated for the selected deviation alarm.



Never / Always / During specified time ranges. Select one of these options to specify when the selected EL042 output or outputs should be activated.

Available EL042 Outputs. Select which of these outputs should be activated when the deviation alarm is triggered. You must select at least one output from this list.

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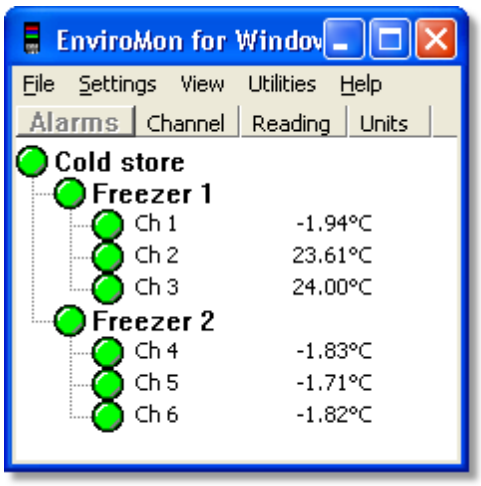
3.5.5.3 Nested deviation alarms

You can nest deviation alarms. In other words, you can set up one deviation alarm that monitors the channels already being monitored by one or more other deviation alarms. This is useful when you wish to apply two conditions simultaneously to a group of channels. For detailed instructions, see How to set up nested deviation alarms 33.

When nested deviation alarms are in use, the Monitor view 7 will look like this example:



This shows two freezers in a cold store.

Freezer 1 is a deviation alarm that is monitoring the three channels Ch 1 to Ch 3, which are three zones in Freezer 1. It will activate an alarm if one of the zones becomes significantly hotter or colder than the others.

Freezer 2 is a second deviation alarm that is monitoring the three channels Ch 4 to Ch 6. These are the temperatures of three zones in Freezer 2.

Cold store is a third deviation alarm that is monitoring all six channels of Freezer 1 and Freezer 2 at once. This allows us to set a new, independent alarm on the six channels. For example, if Freezer 1 and Freezer 2 are set to "Difference reference" mode, we could set the Cold store alarm to "Median reference" mode to check that the temperatures of Freezer 1 and Freezer 2 track each other within specified limits.

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3.6 Troubleshooting and maintenance

3.6.1 Troubleshooting

Logger won't communicate with the computer

This could be caused by:

- Incorrect port selected on computer
- Cable not connected or faulty
- Incorrect baud rate setting on logger

If you have an EL018 battery backup unit, but have not checked the appropriate box in the Logger options 89 dialog, the unit will assume that the mains power has failed. Plug the mains power adapter directly into the logger, then reconfigure the logger.

Logger won't talk to one or more converters

This could be caused by:

- Incorrect logger configuration
- Faulty or disconnected cabling
- Faulty converter
- Faulty logger

See Converter light 103 for information on interpreting the flashing light on the converter.

If none of the converters are working, disconnect all of them and connect one converter directly to the logger. If this fails, the logger is probably faulty. If it succeeds, try disconnecting sections of the network until it starts working.

If more than one converter is not working, and all of the malfunctioning converters are all on the same section of the network, replace the converter nearest the logger. If this cures the problem, the converter is faulty, otherwise the network cable leading to the nearest converter is probably faulty.

If just one converter is not working, do the following tests:

- Disconnect the network from the logger and connect the malfunctioning converter directly to the logger
- Connect another converter at the same location as the malfunctioning converter

Sensor fail or incorrect reading

This could be caused by:

- Sensor cable damaged or disconnected
- Sensor connector dirty
- Interaction with faulty sensor on same converter
- Faulty converter

If all of the sensors on one converter are misbehaving, replace the converter with another unit. If this cures the problem, the converter is faulty. If not, disconnect all of the sensors and plug in one sensor at a time.

Note: With this fault it may take some time for the logger to return to displaying the correct temperature. You can accelerate the process by restarting the logger after connecting each sensor.

If all sensors except one seem to function on their own, reconnect all of the sensors except the one that malfunctions.

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3.6.2 Maintenance

Logger

The logger requires little maintenance. You should check at least once a year that the rechargeable battery is capable of operating the unit for a satisfactory period.

Converter

For a standard converter, disconnect the unit and inspect the connectors for signs of corrosion and for deposits of dust or debris.

If condensation is a problem, it is usually caused by damp air drawn into the box during cooling, and dry air being expelled as the box warms up. This can be eliminated by fitting a PVC breather pipe about a metre long to one of the cable glands.

Remote alarm

Check connectors for signs of corrosion, dust or debris. Reconnect the unit and simulate a fault to check that the audible alarm is working.

Alarm dialler

The Menvier dialler loses its telephone numbers and messages if the power goes off. If this happens, the unit will beep every few seconds, and will display a message. If the dialler is not in an occupied area, you should check it daily.

If operation during a mains power failure is required, you should check the battery every three months. First, run the PC software to download all data stored in the logger, then turn off the power to the alarm dialler. The left-hand green light should go off, but the right-hand green light should stay on. The logger should carry on operating as normal. Turn on the mains power again, and the left-hand green light should come on.

Once a year, you should check that the complete dialler system is working. First, notify all of the contacts that you are about to test the system, and check that they remember how to acknowledge the alarm. Next, simulate a fault by disconnecting a sensor. When the logger alarm starts sounding, one of the red lights on the dialler adapter should come on, and the dialler should start making calls.

Sensors

Check annually for signs of corrosion on the sensor, or for a build-up of debris on the connector.

3.6.3 Calibration

There are several levels of calibration:

- Calibration by a nationally accredited test house (e.g. NAMAS in the UK)
- Calibration using equipment calibrated against national standards
- Comparison against other equipment as a 'sanity check'

Calibration by a nationally accredited test house is necessary only if there is some legal, regulatory or technical reason for doing so. For example, a company that manufactures gas meters might be required to prove that the meters were calibrated at a particular temperature.

Calibration using equipment calibrated against national standards is the most common option. This can be carried out by a test house, the manufacturer or distributor, or by the user if the required equipment is available.

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The 'sanity check' test should be carried out by the user at intervals determined by the application, the hostility of the environment and the importance of accurate readings.

Unless the tests are carried out by Pico, the converter and sensor should be tested together.

Temperature sensor

EnviroMon temperature sensors are supplied sealed in stainless steel tubes, and are largely unaffected by their environment.

If the temperature is cycled repeatedly while the sensor is immersed or in a damp environment, small amounts of water may be drawn into the sensor,causing a rapid increase in the measured temperature.

If low- or medium-temperature sensors are exposed to high temperatures (greater than 120 °C), the temperature reading may be permanently affected.

Calibration or checking using ice or boiling water is not recommended unless the user has a lot of experience with the required procedures. EnviroMon sensors can be compared with a calibrated reference sensor in any of the following ways:

- Insert both sensors in a bath of liquid that is being stirred continuously
- Insert both sensors into a large block of metal that is insulated from its surroundings
- Bind the two sensors together (with sticky tape or elastic bands), then wrap both sensors and some of the cable in several layers of bubble wrap.

Humidity sensor

Humidity sensors contain a sensor element that absorbs water and other chemicals. The sensor element may quickly become inaccurate if it is exposed to chemicals.

Humidity is very strongly affected by temperature: a 1 °C change difference in temperature between two sensors will produce a 2.5% difference in humidity reading. It is therefore important to take the following precautions when calibrating:

- Use a sealed container that is a small as possible
- Keep the air inside the container moving, but mount the fan motor outside the box
- Insulate the container from conducted and radiated heat sources

Humidity sensors can be checked by:

- Comparing with a calibrated reference sensor
- Measuring the humidity above a saturated solution of a salt (salt cell)

The two most commonly used salts are lithium chloride (11.3%) and sodium chloride (75.3%). These two are preferred because the relative humidity for these two salts is virtually constant over a wide temperature range, but you should note that lithium chloride changes state below 18 °C, and calibration should be done above this temperature. Please study the safety information (available from a chemical supplier) before considering using lithium chloride.

Logger

Loggers do not require recalibration.

Converter

Converters contain no adjustable parts. They are designed for high reliability, and contain built-in components to allow for changes over time, and variations due to temperature and other factors.

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3.6.4 Messages

3.6.4.1 Computer messages

`Logger not found`

This message indicates that the computer could not make contact with the logger. See Troubleshooting 100.

`Logger configuration appears to be incorrect`

This message indicates that the logger configuration is not the same as the configuration in the computer. If you have more than one logger, check that you have connected the correct logger, and that you are using the correct settings in the computer. You can prevent this message from recurring by rewriting the logger configuration. (Click Program in the Configuration control panel.)

`Operation failed`

If the dialog box also says `Get Logger Version`, this message indicates that the computer could not make contact with the logger. See Troubleshooting 100.

If the dialog box also says `Halt the Logger`, you will probably find that the operation will succeed if you try again straight away.

If the dialog box says `Write Text`, contact Pico for a computer software upgrade. Alternatively, shorten all of your sensor names to 15 characters or less.

3.6.4.2 Converter light

When a converter is first connected to the network, or the logger is first powered up, the light on the converter starts flashing approximately four times per second.

When the converter receives a message of any kind from the logger, the light stops flashing.

Once the logger is configured and starts asking for readings from the converters, the light will flash three times (EL001) or twice (EL026) every four or five seconds.

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3.6.5 How to update the logger software

Why do I need to update my logger?

Occasionally, a new release of the EnviroMon software is accompanied by a new version of the software that runs inside your EnviroMon data logger. Once you have installed the new EnviroMon software, you must update your data logger to work with it. You can do this with the Logload command built in to EnviroMon. Pico Technology will advise you if this needs to be done.

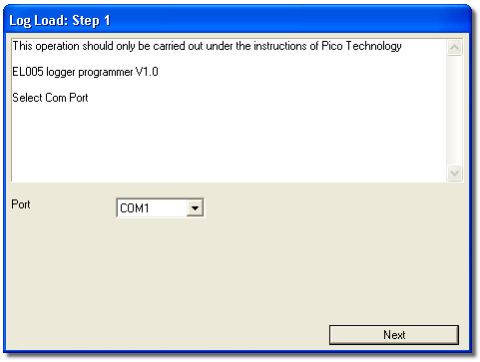
LogLoad instructions

Power the logger and connect it to the COM port.

Ensure that no converters are connected to the logger.

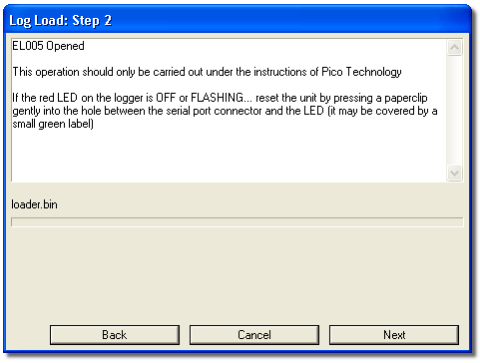
Run EnviroMon.

Click Utilities and then Logload. EnviroMon will display the Logload: Step 1 dialog:



Port: select the number of the RS-232 port to which the data logger is connected.

Click Next. This will take you to Step 2:


Log Load: Step 2
EL005 Opened
This operation should only be carried out under the instructions of Pico Technology
If the red LED on the logger is OFF or FLASHING... reset the unit by pressing a paperclip gently into the hole between the serial port connector and the LED (it may be covered by a small green label)
loader.bin
Back
Cancel
Next

This dialog shows you that EnviroMon has detected the logger. Follow the on-screen instructions and then click Next and wait for programming procedure to end. This will take about a minute. You will then see the Step 3 dialog:

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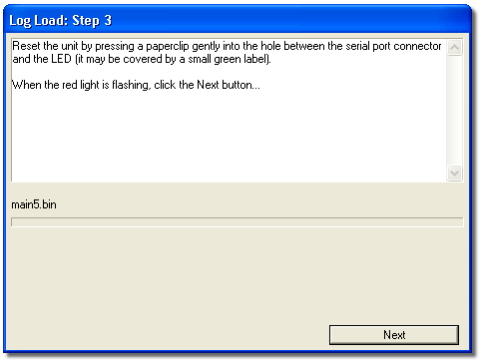
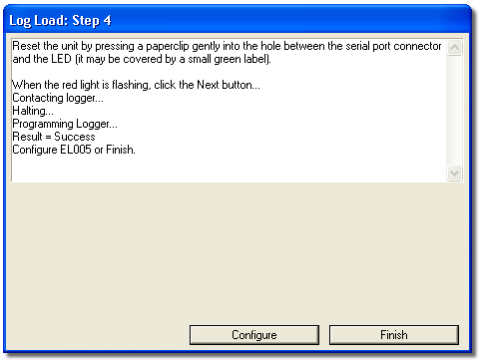

Log Load: Step 3
Reset the unit by pressing a paperclip gently into the hole between the serial port connector and the LED (it may be covered by a small green label).
When the red light is flashing, click the Next button...
main5.bin
Next

Again, follow the on-screen instructions. When the data logger is ready, click Next. Another programming procedure will start, which will again take about two minutes. When this is complete you will see the Step 4 dialog:


Log Load: Step 4
Reset the unit by pressing a paperclip gently into the hole between the serial port connector and the LED (it may be covered by a small green label).
When the red light is flashing, click the Next button...
Contacting logger...
Halting...
Programming Logger...
Result = Success
Configure EL005 or Finish.
Configure
Finish

This dialog gives you the option to configure the logger by clicking Configure. If you wish to do this another time, click Finish.

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4 Programmer's Guide

4.1 Windows drivers

There are two versions of the Windows DLL (Dynamic Link Library) for EnviroMon.

- `EMW.DLL` is for use in 16-bit applications, for example Visual Basic 3, Excel 5, Borland C 4.52, Visual C 1.5, Delphi 1
- `EMW32.DLL` is for use in 32-bit applications, for example Visual Basic 4, 5 etc, Excel 7, Borland C 5, C++ Builder 3 and 4, Visual C 2,3,4,5,6 and Delphi 2, 3, 4

Please note that the drivers cannot be used at the same time as EnviroMon. If it is necessary to access the current readings while EnviroMon is running, you should consider using Dynamic Data Exchange (DDE).

4.2 API

The API (Application Programming Interface) contains the following routines:

- em_open 106 - open the driver
- em_get_sensors 106 - get the number of sensors
- em_get_current 107 - get current readings
- em_close 106 - close the driver
- em_open_reading 107 - open historical readings
- em_get_reading 107 - get historical reading

The procedure for using the driver for current readings is as follows:

```
call em_open
while you want to get readings
   call em_get_current
  process the current values
end while
call em_close
```

4.2.1 em_open

```
void em_open (char * ini_filename)
```

This routine opens the specified INI file (normally `ENVIMON.INI`) and sets up a link to each of the loggers listed in the file. The INI file should have been created and tested using EnviroMon.

4.2.2 em_close

```
void em_close (void)
```

This routine closes down and links to loggers and shuts down the driver.

4.2.3 em_get_sensors

```
short em_get_sensors (void)
```

This routine returns number of sensors.

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4.2.4 em_get_current

```
void em_get_current (short * current)
```

This routine fills the array 'current' with the current reading for each sensor. The return value is the number of sensors. The returned values are integers. If the sensor value has two decimal places, a reading of 24.51 will be returned as 2,451. If no data is available, the value will be set to -32,767.

4.2.5 em_open_reading

```
long em_open_reading(long no_required)
```

Use `em_open_reading()` to 'open' historical readings. The return value is the number of readings available.

4.2.6 em_get_reading

```
em_get_reading (READING * readings, long reading_no)
```

This routine fills structure `readings` with a reading for each sensor and a status byte.

`READING` is defined as

```
typedef struct
{
   short         temperature;
   unsigned char status;
} READING;
```

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4.3 C

For Borland and Watcom C, Visual C version 1.5 or lower, use the `implib` program supplied with your compiler to produce an import library `emwxx.lib` from `emwxx.dll`, where `xx = 16` or 32 as appropriate. The command is

```
Implib emwxx.lib emw.dll
```

For Microsoft Visual C versions 2, 4 and 5, Microsoft no longer supply `implib`. Furthermore, the names used in these versions of C are 'decorated' - there is a prefix which indicates how many bytes are transferred to the routine as parameters. As a result, the C names do not match the names in the DLL. The Microsoft tools to 'alias' decorated to undecorated names do not appear to work, so it is therefore necessary to use ordinal linking - linking by number, rather than name. To find the ordinal numbers for the DLL that you are using, type `DUMPBIN /exports emw32.dll.`

The ordinal numbers and decorated names are entered into `emw32.def`, then the following command generates a lib file: `Lib /def:emw32.def`

Once you have created a lib file, the following steps are then required to use the drivers in your program:

1. Include the `emwxx.lib` in your project.

2. Include the file `emwdll.h` in the C source file(s) of your program.

See `emwdltes.c` for an example of a simple Windows program.

4.4 C++

C++ programs can access all versions of the driver. If `emwdll.h` is included in a C++ program, the PREF1 macro expands to `extern "C"`: this disables 'name-decoration' and enables C++ routines to make calls to the driver routines using C headers.

4.5 Delphi

`emwp.dpr` is a complete program that opens the driver and takes current readings from channels 1 and 2. The file `emwdll.inc` contains a set of procedure prototypes that you can include into your programs.

4.6 LabVIEW

The routines described here were tested using LabVIEW for Windows 95 version 4.0.

It is possible to access all of the driver routines described earlier. The example supplied (`emw.vi`) shows how the routines can be called (opens the unit, takes readings, closes the unit).

To use the example, copy `emw.vi` and `emw32.dll` to your LabVIEW `user.lib` directory.

4.7 File formats and other useful information

4.7.1 Program files

The following program files make up EnviroMon:

`emw.exe` - main program file
`emw???.dll` - language-specific information: `???`=044 for English

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emw.??.chm - help file: ??=en for English

EnviroMon makes no changes to any files in the Windows directory or the registry, and requires no installed drivers.

4.7.2 Envimon.ini

The majority of configuration information is held in a file called envimon.ini. If multiple configurations are required, this can be done by putting each configuration in a separate file, then specifying on the command line which file to use. For example, to use the oxford.ini file, the command line is:

```
emw oxford.ini
```

Note: for multiple configurations, the data path must be different for each configuration.

The detailed information below is intended for information only. Where possible, we recommend using the EnviroMon program to make changes to the settings.

Envimon.ini contains the following sections:

[General] 109	General information
[Holdoff] 111	Details of current holdoffs
[Events] 111	Details of active events
[Loggerx] 111	Details of a logger, x = logger number
[Loggerx, Convertery] 112	Details of a converter, x = logger, y = converter
[Sensor] 112	Details of a sensor
[Graph1] 112	Details of current graph
[Spread1] 112	Details for current spreadsheet
[EventView1] 112	Details of the event window
[Temperature] 112	Temperature display information
[Alarm] 112	Alarm options
[Site] 113	Site information
[Preferences] 113	Colours etc.

[General] section

NoOfLoggers=1	The number of loggers in this configuration
NoOfSensors=10	The number of sensors in this configuration
Configured=Yes	Set to Yes once the system is configured. Until then, the EnviroMon program goes straight to the configuration menu.
DataPath=d:\par	Specifies where data is to be stored
BackupPath=a:\par	Specifies where a backup copy of data is to be stored
AutoBackup=Yes	Specifies whether the program should automatically create a new backup file each time you exit the program

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`Session=0`	Specifies how the EnviroMon program operates the link to the logger. It is important when operating a telephone link, as it is usually desirable to remain connected for as short a period as possible. 0 - connect at start-up and remain connected 1 - connect at start-up and disconnect once data is transferred 2 - do not connect at start-up
`DeleteAfter=0`	This specifies how long data files are to be retained for. The options are: 0 - indefinitely 1 - one month 2 - three months 3 - one year
`MinutesPerReading=10`	The time interval, in minutes, between readings
`SampleMode=0`	Indicates how to take readings: 0 - when the logger memory is full, wrap 1 - when the logger memory is full, stop 2 - stop when max-readings samples have been recorded
`MaxReadings=1000`	The number of readings to take when `SampleMode` is zero
`CurrentFile=`	If you specify a filename here, EnviroMon will write the current readings to a text file with this name, every sample interval. This can be used to transfer the data to another application. For example: `CurrentFile=Current.txt`
`Footer=`	If you wish to replace the footer on reports with text of your own, you can add this parameter, specifying an alternative footer. For example: `Footer=Joe's frozen foods`
`RefreshDelay=0`	Sets the time delay, in seconds, between monitor updates. A value of 60 would mean that the monitor display would be update only once per minute.
`TurnroundMs=2000`	Specifies an extra delay in milliseconds that EnviroMon will wait before setting a time-out error. This setting is useful when using EnviroMon with GSM and radio modems.
`MessageGapMs=2000`	Specifies the time in milliseconds that EnviroMon waits between sending two commands to the logger.
`MaxRetries=1`	Specifies how many times EnviroMon should retry sending a command if a time-out occurs.

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[Holdoff] section

[Events] section

Do not change these two sections

[Loggerx] section

There is one Loggerx section for each logger: x is the logger number.

Connection=0	This specifies how the logger is connected to the computer: 0 - direct 1 - via telephone modem 2 - via radio modem
BaudRate=9600	If present, this overrides the speed of the link to the logger.
Port=1	For direct connections, this specifies which serial port the logger is connected to.
Telephone=01584-823263	The telephone number to dial when the Connection type is 1 (telephone modem)
Address=1	This is the logger address. It is 1 for direct and telephone loggers, but must be a different number for each logger connected by radio modem.
Printer=0	Specifies the type of printer connected to the logger. The options are: 0 - no printer 1 - Epson FX100 2 - Datac tally-roll
PrintCurrent=No	Specifies whether the current values are to be printed at specified intervals
PrintSummary=No	Specifies whether a summary report (min/max/average) is to be printed at specified intervals
CurrentMinutes=60	The time interval, in minutes, between print-outs of the current values
SummaryMinutes=1440	The time interval, in minutes, between print-outs of the summary report
MainsFailMinutes=5 NetFailMinutes=5 NoOfConverters=7 AnswerStart=1260 AnswerEnd=1320	These specify the time range (in decimal minutes, so 1260 means 21:00) during which the logger will enable a modem to answer telephone calls.
diallerPresent=No	Indicates whether the EL018 dialler/battery backup module is connected. If so, the logger is unable to detect mains failure, as it is not connected directly to the mains adapter.

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[Logger1, Converter1] section

There is one entry like this for every converter in the system. It contains the information that appears in the converter list.

Address=5	The converter address
Type=4	The converter type

[Sensor1] section

Name=Box	This sensor name is displayed by the logger and appears on reports
Logger=1	The logger that this sensor is connected to
Converter=12	The address of the converter that this sensor is connected to
Channel=1	The channel on the converter for this sensor
Active=Yes	Yes while the sensor remains in use, and No when the sensor is no longer required.
ConverterType=2	The type of converter
Type=0	The type of sensor - see the scaling dialog 82 for more details (0 = default)
AlarmEnabled=No	Yes if the alarm is enabled for this sensor
Minimum=-2000	The minimum threshold for alarms
Maximum=7000	The maximum threshold for alarms
Holdoff=0	The hold-off period in minutes for the alarm

[Graph1] section

[Spread1] section

[EventView1] section

These sections contain information about the current windows. If a particular window is causing problems, it may be worthwhile erasing the corresponding section of the INI file.

[Temperature] section

Do not change this section.

[Alarm] section

Hysteresis=50	Controls the amount of hysteresis used for alarms. See the Alarm dialog 78 for a detailed description.
Latch=No	Specifies whether the alarm should continue to sound until the user cancels it, even if the alarm condition goes away in the meantime.

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[Site] section

```
Name=Fresher Foods Limited
Maintenance=I C Gale Refrigeration Ltd 01116-212405
```

This information appears on graphs and spreadsheets.

[Preferences] section

`Colour7=8421376`
`Colour8=8388863`
`Colour9=12632256`

These specify the colours of traces for the graph.

`FirstDayOfWeek=0`

Specifies which day is to be treated as the first of the week. This is used by the Select this week button in the Graph window. The default value of 0 means Monday, 1 means Tuesday, and so on.

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4.7.3 .RDG files

Each time the computer connects to the logger, it transfers any new readings from the logger and saves them in a reading (`.RDG`) file. The filename is a hex date code (see below) containing the date and time of the most recent addition to the file.

The computer adds the data to the most recent file UNLESS one of the following conditions applies:

- Data file would exceed 64 kilobytes
- Settings have changed since the last data was transferred
- Values span a month end

The last rule is so that, if required, it is possible to dispose of data files after a certain period of time (say three months).

When new data is received, the current data file is replaced by a new file which contains both the existing data and the new data. When the current data file is full, or at the start of a new month, the program creates a new file that contains the following components:

- A reading header record
- A list of the sensor numbers stored in this file
- The reading data

Reading header record

```
typedef struct
UNS16 version;
UNS16 no_of_readings;
UNS16 no_of_sensors;
UNS32 gmt_start;
UNS32 gmt_end;
UNS16 minutes_per_reading;
UNS8 spare [40];
READING_HEADER;
```

Sensor numbers

This is a list of the sensor numbers for which data is recorded. There is a 16-bit value for each sensor. If, for example, the file contains data for sensors 1, 3 and 4 (sensor 2 is disabled), `reading_header.no_of_sensors` would be set to 3, and the sensor number list would contain 1, 3 and 4. There would be three sensor reading entries for each reading.

Reading data

```
typedef struct
INT16 temperature;
UNS8 status;
SENSOR_READING;
```

Each reading is made up of a block of 3-byte `SENSOR_READING` records, one for each entry in the sensor number table.

`Date/time code`

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The date/time code is made up of the time, in minutes, and the day number. Day 1 is the 1st January 1980.

```
Date/time code = day number * 1440 + time
```

4.7.4 EMWEVENT.LOG

This file contains details of the events that have occurred since the log was created (parameters out of range, equipment failures, etc.)

4.7.5 DDE

Dynamic Data Exchange (DDE) is a convenient method of transferring the current set of readings to other applications. Data is transferred approximately once per second.

Data items are identified by three keywords: `Application`, `Topic` and `Item`. The keywords accepted by EnviroMon are:

```
Application  EMW
Topic        Current
Item         Name - parameter name
```

`Value` - the current value

`Units` - the units

`Alarm` - the alarm status

Each DDE request returns a list of values for each parameter.

To read the current values into Excel, type the following command into a spreadsheet cell:

```
=EMW|Current!Value
```

To read the current values into Quattro Pro, type in the following command into a cell:

```
@DDELINK([EMW|Current]Value)
```

Most application programming languages (C, Delphi, Visual Basic) provide tools to make DDE requests from other applications.

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4.8 Communications protocols

4.8.1 EnviroMon logger protocol

The computer normally uses 57,600 baud for a direct link to a logger, and 9,600 over a modem link. Data is transmitted with 8 data bits, two stop bits, no parity. No flow control lines are used.

All messages to and from the logger have the following format:

Byte	Name	Usage
1	length	This is the total length of the message, including 3-byte header and 1-byte checksum. The maximum message length is 254 bytes.
2	address	This is normally 1, unless you are using several loggers on a multi-logger radio modem network
3	function	0: LF_GET_BLOCK 19: LF_GET_READING_VALUES Other functions are available
4	DB1	This is the data part of the message
...	...	
4+n-1	DBn	
4+n	checksum	Calculate the SUM of all preceding bytes. Checksum is (0xDE - SUM)

The computer sends a request to the logger, and then the logger sends a response (for most functions, within 200 ms).

LF_GET_BLOCK

When the computer wants to get a block of data from the logger, it sends an LF_GET_BLOCK request, which contains two bytes of data in the data part of the message:

Byte	Name	Usage
DB1	Block ID	0: LB_VERSION 3: LB_CURRENT 4: LB_NO_OF_READINGS 10: LB_FIRST_READING 11: LB_MAX_READINGS 14: LB_ALARM_ACTIVE
DB2	Section number	You probably won't need this. We can supply more information if required.

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The data part of an LF_GET_READING response for an LB_CURRENT request is as follows:

Byte	Name	Usage
DB1	value 1 MSB	most significant (upper) byte of current reading for sensor 1
DB2	value 1 LSB	least significant (lower) byte of current reading for sensor 1
DB3, 4	value 2	current reading for sensor 2
DB5, 6	value 3	current reading for sensor 3
...	...	

The data part of an LF_GET_BLOCK response for an LB_ALARM_ACTIVE request is as follows:

Byte	Name	Usage
DB1	alarm 1	Alarm status for sensor 1 0 - alarm off 1 - alarm on
DB2	alarm 2	Alarm status for sensor 2
DB3	alarm 3	Alarm status for sensor 3
...	...	

LF_GET_READING_VALUES

Before attempting to get stored readings from the logger, it is necessary to read the following three blocks:

LB_NO_OF_READINGS
LB_FIRST_READING
LB_MAX_READINGS

The readings are stored in a circular buffer that contains 15,000 two-byte values. Values below -32511 are reserved for error codes, leaving numbers between -32511 and 32767 for data values.

Example

If a logger is configured for three sensors, and is left running for an hour collecting one reading every 5 minutes, these values will be as follows:

LB_NO_OF_READINGS	= 12 (12 x 5 minutes = 1 hour)
LB_FIRST_READING	= 0
LB_MAX_READINGS	= 5000 (calculated by software)

If the logger is left until 6000 readings have been collected, the values will be:

LB_NO_OF_READINGS	= 5000 (not 6000, because LB_NO_OF_READINGS cannot exceed LB_MAX_READINGS)
LB_FIRST_READING	= 1000 (location of oldest reading in buffer)
LB_MAX_READINGS	= 5000

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After 6000 readings have been taken, the buffer will contain the following values:

Value number	Reading number	Channel number
0	4000	0
1	4000	1
2	4000	2
3	4001	0
...		
2996	4998	2
2997	4999	0
2998	4999	1
2999	4999	2
3000	0	0
3001	0	1
3002	0	2
3003	1	0
3004	1	1
...		
14995	3998	1
14996	3998	2
14997	3999	0
14998	3999	1
14999	3999	2

The reading buffer is accessed by sending a LF_GET_READING_VALUES message asking for a sequence of values. To improve the data transfer rate, you can ask for up to 125 values to be returned at once.

The data part of the LF_GET_READING_VALUES message contains the following data:

Byte	Name	Usage
DB1	value no MSB	most significant (upper) byte of value no
DB2	value no	
DB3	value no	
DB4	value no LSB	least significant (lower) byte of value no
DB5	no of values	number of values to send

To get the values for 3 channels for the oldest five readings in the above example,

value no	= 1000 x 3	= 3000
no of values	= 5 x 3	= 15

The response would contain the following data:

Byte	Name	Usage
DB1	value 3000 MSB	value for reading 1 channel 1
DB2	value 3000 LSB	
DB3,4	value 3001	value for reading 1 channel 2
DB5,6	value 3002	value for reading 1 channel 3
DB7,8	value 3003	value for reading 2 channel 1
DB9,10	value 3004	value for reading 2 channel 1
...		
DB29,30	value 3014	value for reading 5 channel 3

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